universität wien

MASTERARBEIT | MASTER'S THESIS

Titel | Title

The Catalyst of Agile Teamwork: Exploring the Role of the Agile Mindset

verfasst von | submitted by

Kai Patrick Schmalow BSc

angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien | Vienna, 2025

Studienkennzahl lt. Studienblatt | Degree programme code as it appears on the student record sheet:	UA 066 840
Studienrichtung lt. Studienblatt | Degree programme as it appears on the student record sheet:	Masterstudium Psychologie
Betreut von | Supervisor:	Univ.-Prof. i.R. Dr. Erico Kirchler

Acknowledgements

First and foremost, I would like to express my deep gratitude to Dr. Christoph J. Stettina, who served as my primary supervisor for this Master's thesis. His guidance was invaluable throughout the entire process as he supported me by brainstorming ideas, patiently sitting through my endless pitches on how to deepen the data analysis, consistently providing the constructive feedback I needed to improve the paper, and dedicating many long Wednesday afternoons to our discussions. I am truly grateful to Dr. Erich Kirchler for his steady guidance throughout the completion of this thesis. His calm demeanor and thoughtful feedback provided clarity and direction throughout the development and writing process. By encouraging me, he ensured that I remained focused and motivated throughout each stage of development. Leiden University also deserves my gratitude for funding the Cloudresearch Data, enabling me to produce a robust data analysis. Next, I would like to thank my fellow students for always having my back and cheering me up when I did not feel like it. Special thanks to Laurenz Lienerbrünn, the person with the toughest, most honest, but, most importantly, constructive and helpful feedback I have ever received, a friend I can always rely on. My thanks also go out to Stefan Pfleger, who knows the APA guidelines like no other and gave me invaluable feedback. I would like to thank Marvin Barghahn, the mastermind who knows all the guidelines the University of Vienna demands and how to implement them, and Almut Stampe, whose input on the structure and common theme of the theoretical background and discussion sections was invaluable. A big thank you goes to my family, who always wanted to help and support me, even though they did not know exactly what I was doing. Finally, I would like to thank Myrna, Dennis, Marius, and Hendrik for listening to countless hours of statistical monologues and worries during library breaks throughout the year.

Abstract (English)

Agile methodologies have been widely adopted across industries due to their efficiency and adaptability. However, the anticipated benefits are not always realized. A major factor in achieving agile efficiency is fostering an agile mindset, which is frequently overlooked by organizations that focus solely on implementing agile work practices. This study aimed to quantify the role of an agile mindset in shaping the relationship between agile work practices and teamwork quality. Employing a cross-sectional design, the researchers collected data from 401 participants through an online questionnaire targeting members of project and product teams with varying project management approaches. In line with our hypothesis, the results of the structural equation model revealed a mediating role of the agile mindset in strengthening the link between agile work practices and teamwork quality, a consistent pattern across two samples. Among the practices examined, iterative development demonstrated the strongest association with both the agile mindset and teamwork quality, while retrospective frequency produced conflicting findings. In summary, this paper adds to the existing body of knowledge by empirically testing the positive relationships among agile work practices, the agile mindset, and their connection to teamwork quality. These findings provide practical insights for organizations wanting to refine their practices, cultivate a mindset change among team members, and ultimately enhance teamwork quality within their agile teams.

Keywords: Agile, Agile Mindset, Agile Work Practices, Teamwork Quality, Mediation, Cross-sectional design, SEM

Contents

Acknowledgements **1**

Abstract (English) **2**

1 Introduction **5**

2 Theoretical Background **7**

2.1 The Relationship Between Agile Work Practices and the Agile Mindset . 7

2.2 Scientific Conceptualization of the Agile Mindset and its Connection to Teamwork Quality 9

2.3 The Synergy of Teamwork Quality and Agile Work Practices 11

3 Research Question and Hypothesis **13**

4 Methodology **14**

4.1 Research Design and Rationale 14

4.2 Participants and Procedure 14

4.2.1 Sample 1 - LinkedIn 15

4.2.2 Sample 2 – Company samples 16

4.2.3 Sample 3 – CloudResearch Connect 17

4.3 Measures 18

5 Results **20**

5.1 Assumption Testing 21

5.1.1 Outliers 21

5.1.2 Linearity 21

5.1.3 Distribution 23

5.1.4 Homoscedasticity 23

5.1.5 Multicollinearity 24

5.1.6 Reliability 24

5.2 Scale Comparison of ASA and AWPI 24

5.3 Mediation Analysis 27

5.4 Exploration 28

6 Discussion **30**

6.1 Study Purpose and Summary 30

6.2 Theoretical Implications 32

6.2.1 Understanding the Mediation Framework: Path Dynamics and Implications 32

6.2.2 Generalizability of Results Across Different Samples 35

6.2.3 Iterative Development & Retrospectives: Patterns with Teamwork Quality 37

6.2.4 Complications of Measuring Agile Work Practices 39

6.3 Practical Implications 41

6.3.1 The Agile Mindset as a Catalyst for Agile Teamwork Quality . . . 41

6.3.2 The Attitudes of the Agile Mindset and their Link to Teamwork Quality: Self-Guidance and Collaborative Exchange 42

6.3.3 Iterative Development and Retrospectives as the Most Impactful Agile Work Practices 44

6.4 Limitations 45

6.5 Future research 47

7 Conclusion **48**

References **50**

Appendix **61**

1 Introduction

How does agility drive team collaboration? Are structured practices, a foundational mindset, or their synergy the solution? We propose that psychological mechanisms, specifically team members' attitudes, are the underlying drivers of successful agile collaboration. This focus on mindset and attitudes aligns with the original vision of the Agile Manifesto, which prioritized adaptability, collaboration, and customer-centricity (Beck et al., 2001). Originally designed to address challenges in software development, agile methodologies have since evolved into a best practice across industries, becoming essential for navigating today's fast-paced business environment (Bennett and Lemoine, 2014; Dingsøyr et al., 2012;Kuhrmann et al., 2022; Rigby et al., 2016). However, while agile frameworks like Scrum and Kanban provide methodological approaches to agility, we propose that their success ultimately depends on fostering an agile mindset, a set of attitudes that enable teams to internalize and embody the principles behind these practices.

Teams are increasingly adopting agile and hybrid methodologies because of their reputation for improving efficiency and collaboration. In the direct comparison, agile methodologies show higher project success (Serrador and Pinto, 2015), increased productivity (Dybå and Dingsøyr, 2008; Olszewska et al., 2016), and organizational performance (Stettina et al., 2021) compared to traditional plan-driven teams. Further, the use of agile work practices in teams has been shown to increase teamwork quality (Lindsjørn et al., 2016), team creativity (Uraon et al., 2024a), improved team communication (Pikkarainen et al., 2008), commitment (Koch and Schermuly, 2021), team cohesion (Wellington et al., 2005) and team performance (Junker et al., 2022; Malik et al., 2021; Melo et al., 2013).

While organizations widely adopt agile frameworks such as Scrum and Kanban, empirical evidence suggests that these methodological implementations alone do not consistently deliver the expected improvements, as successful teams are characterized by their ability to internalize the agile principles (Dingsøyr and Lindsjørn, 2013; Hohl et al., 2018; Klünder et al., 2022; Miler and Gaida, 2019; Ozkan et al., 2023). Without this foundational understanding, teams may focus on ”Doing Agile” (implementing practices) rather than ”Being Agile” (adopting an agile mindset). This distinction between the importance of agile work practices and an agile mindset

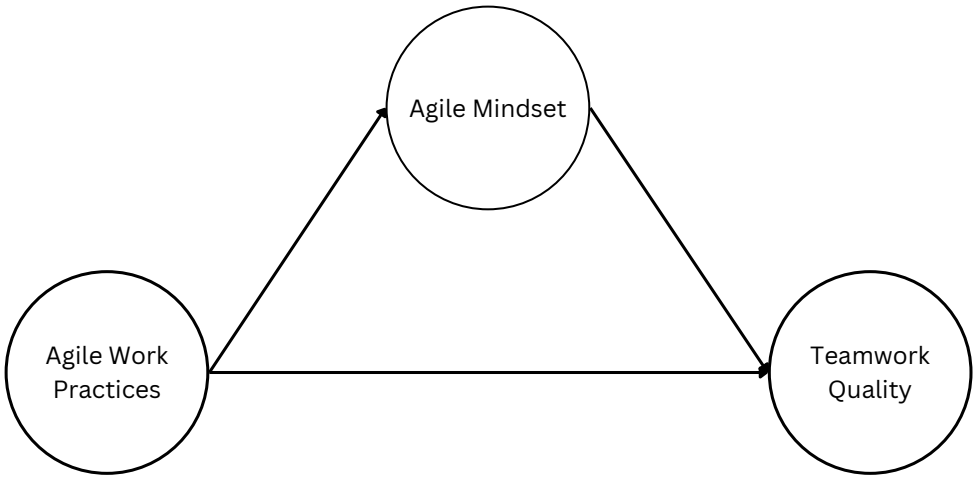
has gained significant traction in recent years, with growing interest across both scientific (e.g. Eilers et al., 2020; Miler and Gaida, 2019) and business communities (Agile Scrum Group, n.d.; Krasteva, 2022).

The agile mindset, defined as a set of attitudes aligned with the principles of the Agile Manifesto (Beck et al., 2001), has been shown to be a contributing factor to effective team functioning, as research has demonstrated its relationships with both organizational and team-level outcomes (Eilers et al., 2020; Eilers et al., 2022; Stettina and Knoop, 2024). Because agile is fundamentally people-centric, individual psychological factors play an important role in predicting team collaboration (Nerur et al., 2005; Ozkan et al., 2024). These attitudes, captured in the agile mindset construct, provide the psychological foundation for team interactions, improving the overall teamwork quality.

Inspired by the Input-Mediator-Output (IMO) model presented by Mathieu et al. (2008), we propose that agile work practices create a collaborative context that enhances teamwork quality, with this relationship mediated by psychological mechanisms within team members. We argue that companies that are quick to adopt agile work practices through agile frameworks run the risk of underestimating the importance of fostering a broad mindset change, thereby overlooking a core aspect. Improvements in teamwork rely on openness to collaboration, empowerment, and continuous improvement between the team members, which is captured in the agile mindset (Dikert et al., 2016; Eilers et al., 2020; Gandomani et al., 2014; Klünder et al., 2022; Pikkarainen et al., 2008). Therefore, this paper explores the agile mindset's role in the relationship between a team context (agile work practices) and team collaboration (teamwork quality), addressing the research question: To what extent does the agile mindset explain variations in teamwork quality associated with agile work practices among project/product team members?

Figure 1

Theoretical Framework



2 Theoretical Background

2.1 The Relationship Between Agile Work Practices and the Agile Mindset

Agile methodology, agile work practices, or simply agility all fall under the umbrella term “agile” (Abbas et al., 2008). When defining agile, one encounters two different approaches that make it difficult to establish a clear definition. One emphasizes the philosophical principles of growth and adaptability outlined in the Agile Manifesto (Beck et al., 2001; Highsmith and Cockburn, 2001), while the other focuses on specific methodological practices such as iterative development (Abbas et al., 2008). Building on this distinction, our theoretical framework positions agile work practices as representing the methodological side of the definition (”Doing Agile”). They establish the project management approach that shapes the conditions under which teams interact.

Although capturing agile work practices (”Doing Agile”) appears simple at first glance, the diversity of agile frameworks and teams’ tendencies to adopt hybrid solutions creates significant complexity in the measurement (Kuhrmann et al., 2022). This measurement challenge is further complicated by the IT-centric nature of most existing assessment tools (So and Scholl, 2009; Swiss Agile Research Network, 2018). A scientific scale was developed by So and Scholl (2009), who conceptualized a scale using eight IT-specific practices as factors. This IT-related focus was

appropriate at the time, as agile was just beginning to spread beyond software development into other business areas, but since this expansion, a broader approach has been needed (Oprins et al., 2019; Stettina and Knoop, 2024). Oprins et al. (2019) address this research gap and the IT-department bias. In their interview study, they narrowed the eight given practices of So & Scholl down to four main practices.

This paper follows the definition and conceptualization of Junker and his team (2023), who validated the ”agile work practices instrument” (AWPI). Their approach follows a similar structure to Oprins et al. (2019), conceptualizing the instrument around four key practices: ”sprints”, ”iterative development”, ”standup meetings,” and ”retrospective” meetings.

”Sprints” (Sp) are short work cycles with defined goals that enhance flexibility and create structured opportunities for team collaboration. Through this approach, team members can self-guide their work while maintaining organized opportunities for customer interaction, balancing autonomy with feedback.

To improve team communication and coordination, regular ”standup meetings” (StM) are used. These are short meetings, where each team member gives an update on the current state of their ticket or work. Standup meetings offer a chance for team members to engage with one another and exchange their knowledge.

”Retrospective” (Re) meetings are, as their name suggests, reflection sessions to examine the past sprint and foster continuous learning. These reflection sessions are meant to improve team members’ skills, by reflecting on mistakes and learnings.

Lastly, ”iterative development” (ID) can be described as an overarching approach to a project that uses low-cost experimentation and feedback loops to continually refine goals while maintaining adaptability (Junker et al., 2023).

Implementing agile work practices and agile mindset have been seen as two distinct aspects, which need to be trained separately when implementing agile, a relationship primarily explored through qualitative approaches (e.g., Klünder et al., 2022; Neumann et al., 2024; Sureshchandra and Shrinivasavadhani, 2008) with limited quantitative investigation. However, research has shown that agile work practices positively correlate with constructs similar to the agile mindset, such as psychological empowerment (Malik et al., 2021; Koch and Schermuly, 2021), team efficacy (Uraon et al., 2024a), project commitment (Uraon et al., 2024b) and

psychological safety climate (Peeters et al., 2022). These findings indicate that agile work practices and the agile mindset might be directly linked, a logical relationship given that frameworks were originally derived from the principles outlined in the Agile Manifesto. The close connection is evident as Agile Manifesto authors such as Ken Schwaber and Kent Beck participated in developing the agile frameworks Scrum and Extreme Programming (Beck, 2000; Dingsøyr et al., 2012; Schwaber, 1997). In addition, the practices employed in most agile frameworks, such as the iterative approach, predate the Agile Manifesto. This underscores how methodologies and agile principles have evolved together over time (Abbas et al., 2008).

Further, team-level studies have indicated, that team-level constructs such as team climate improve individual-level factors such as motivation, creativity, or attitudes (Kozlowski and Ilgen, 2006; Magni et al., 2018; Zhu et al., 2018). Similarly, we assume agile work practices and the agile mindset to be associated, with the theoretical implication that agile work practices are the foundation for fostering an agile mindset. This aligns with the two perspectives reviewed thus far, as agile work practices do not directly create an agile mindset, but rather lay the foundation for its development.

2.2 Scientific Conceptualization of the Agile Mindset and its Connection to Teamwork Quality

Having established the ”Doing Agile” component of our framework, we now examine the ”Being Agile” aspect. “Being Agile” means having an agile mindset, therefore adopting the mentioned values and principles of the Agile Manifesto (Eilers et al., 2022; Nerur et al., 2005). Since agile is a people-centered approach where team members need to function and collaborate in small teams, rather than working in a predefined process, the mindset toward teamwork is much more essential (Nerur et al., 2005). Agile team members are empowered in their role and carry more responsibility, which might be overwhelming at first (Eilers et al., 2020; Nerur et al., 2005). Agile work practices foster greater team and individual autonomy compared to traditional approaches, as they shift task prioritization and selection from project leads to individual team members, enabling task self-assignment and self-management of work execution (Schwaber and Sutherland, 2020). Therefore, team members must go beyond following a set of rules by actively coming up with innovative behaviors.

Research indicates that agile is most successful when team members internalize these principles and work self-guided (Ozkan et al., 2023).

Capturing ”Being Agile” presents similar challenges to conceptualizing ”Doing Agile”. The term ”agile mindset” (AM) and related concepts such as agile principles (Hohl et al., 2018) or culture (Scrum Alliance, 2013) have appeared throughout the literature, but lacked quantitative conceptualization until Eilers and colleagues’ (2022) study. The foundation for understanding this concept emerged through qualitative research, with van Manen and van Vliet (2014) identifying defining factors in large-scale agile approaches, followed by Mordi and Schoop’s (2020) efforts to refine its definition. Building on these qualitative insights, Eilers et al. (2022) developed a higher-order factor structure that integrates previous findings into a cohesive construct. We adopt their conceptualization of the agile mindset as a dynamic set of attitudes aligned with the principles of the Agile Manifesto. The 20 validated agile mindset items loaded on the following four distinct first-order factors.

“Attitude towards empowered self-guidance” describes the willingness to work independently and reflect on one’s approaches to a goal. As mentioned before, agile team members are empowered in their role, meaning, they need to have a complementing attitude to fit into said environment (Nerur et al., 2005). Self-guidance and self-regulation have been shown to play a critical role in collective efficacy and team performance (Brown, 2003; Dierdorff and Ellington, 2012). Similarly, we expect that the attitude towards empowered self-guidance is associated with teamwork quality, by increasing individual effort towards set team goals.

”Attitude towards customer co-creation” captures how team members actively seek customer feedback to deliver value, which aligns with the iterative nature of agile (Oprins et al., 2019; Junker et al., 2022). We expect to find similar relationships as Stettina and Knoop (2024), whose research demonstrated strong correlations between customer co-creation attitudes and all teamwork quality dimensions.

”Attitude towards learning spirit” represents an individual’s openness toward learning and growth, directly aligning with the Agile Manifesto’s core principle of continuous improvement (Beck et al., 2001). It is similar to the psychological construct of the Big Five “openness to new experiences” (McCrae and Costa, 1987) or the Growth Mindset by Dweck (2006). Aligning with Han et al. (2022), we believe that the

attitude towards learning spirit enhances mutual support within the team, leading to an overall improved quality of teamwork.

”Attitude towards collaborative exchange” emphasizes open communication and knowledge sharing among team members, an aspect that Pikkarainen et al. (2008) identified as fundamental to agile team success. In support of this view, Stettina and Knoop (2024) demonstrated that this attitude shares the strongest connections to teamwork quality.

Research by Eilers and her team (2022) established that the agile mindset is positively associated with organizational performance. This finding, combined with evidence that individual roles and individual-level traits shape team outcomes, suggests that team members’ agile mindset should be positively linked to teamwork quality (Stewart et al., 2005; Dierdorff and Ellington, 2012). Sathe and Panse (2022) come to the same conclusion, as their research indicates that adopting an agile mindset helps aid in increasing team productivity during a crisis, like the COVID-19 pandemic. Consistent with the findings on the agile mindset so far, we anticipate that the agile mindset will demonstrate a positive association with teamwork quality, aligning with Stettina and Knoop (2024).

2.3 The Synergy of Teamwork Quality and Agile Work Practices

To evaluate how different levels of agile work practices relate to team collaboration, we focused on measuring teamwork quality, which also serves as a proxy for overall team performance (Hoegl and Gemuenden, 2001; Lindsjørn et al., 2016). Hoegl and Gemuenden (2001) argue that team success depends on collaboration and interaction within the team. Focusing on teamwork quality aligns with Hohl et al. (2018), who emphasized that agile is designed to improve team environments. We assessed this construct among our participants by employing the teamwork quality (TWQ) questionnaire developed by Hoegl & Gemuenden, comprised of six subfactors (Hoegl et al., 2004).

”Communication”, the first subfactor of teamwork quality, emphasizes open, informal, and frequent interactions among team members as conceptualized by Hoegl and Gemuenden (Hoegl and Gemuenden, 2001; Gladstein, 1984; Pinto and Pinto, 1990). This idea was also supported for agile teams by Pikkarainen et al. (2008), who

concluded that communication is one of the most important factors when it comes to team success in agile teams. Conforto et al. (2016) add that communication influences an agile team's ability to adapt effectively to dynamic project needs.

The second factor, "coordination", measures how effectively team members synchronize their activities. Communication and information transfer are essential components of effective coordination, to which agile work practices specifically contribute by prioritizing direct interactions over extensive documentation (Malone and Crowston, 1994; Pikkarainen et al., 2008). Similarly, Strode et al. (2012) identify mutual adjustment as a core mechanism through which agile work practices improve team coordination. This adjustment process is facilitated through activities like Scrum's daily standups and sprint planning meetings, which create regular synchronization opportunities for team members (Strode et al., 2012; Scrum Alliance, 2013).

"Balance of member contributions", the third factor, involves including individual team members' knowledge and experience in the decision-making process, regardless of their actual expertise (Hoegl and Gemuenden, 2001). Agile work practices such as planning meetings and daily standups facilitate balanced task distribution and coordination, supporting a system in which team members primarily self-select assignments based on their skills rather than top-down instructions (Schwaber and Sutherland, 2020). Therefore, mutual trust naturally develops as a foundation for a balanced distribution of tasks (Eilers et al., 2020; McHugh et al., 2012; Nerur et al., 2005).

In line, the subfactor of "mutual support" also describes the respectful assistance of team members, when in need (Hoegl and Gemuenden, 2001). Dingsøyr and Lindsjørn (2013) analyzed a similar construct with agile practitioners, namely backup behavior or redundancy as described by Strode et al. (2022). Through frequent communication and the backlog in Scrum, IT team members recalled helping one another regularly and showed said backup behavior (Strode et al., 2022). In IT departments, backup behavior, and therefore mutual support, is often implemented through paired programming tasks, requiring team members to allocate time for collaboration (Coman et al., 2014; Dingsøyr and Lindsjørn, 2013; Strode et al., 2022). Another example is the practice of collective code ownership, found in Extreme

Programming, which promotes mutual adjustment and collaborative behavior among team members (Lindsjørn et al., 2016).

The ”effort” subfactor is defined as the individual endeavor to support the team’s goal and synchronized priority regarding these goals (Hoegl and Gemuenden, 2001). Research has identified task prioritization as one of the most significant contributors to effective teamwork and performance in agile teams (Dingsøyr and Lindsjørn, 2013). Agile work practices consistently revisit task prioritization through the iterative approach (Schwaber and Sutherland, 2020). The consistent synchronization of team members through practices like Scrum’s daily standups leads to consistent output and effort between team members (Schwaber and Sutherland, 2020).

Lastly, ”cohesion” represents members’ collective desire to stay united as a team (Hoegl and Gemuenden, 2001). McHugh et al. (2012) argue that team cohesion is founded on trust, which is essential for agile teams due to their high level of autonomy. Based on qualitative interviews, they found that agile work practices improved trust by fostering transparency, open communication, and continuous knowledge exchange. Dingsøyr and colleagues (2016) argue that agile inherently promotes team cohesion through various practices. Scrum emphasizes daily collaboration through standups, joint iteration planning, and review sessions. Similarly, Extreme Programming enhances cohesion through development-focused practices like pair programming and shared code ownership.

Drawing from the presented theoretical foundations and empirical research of the interrelationships between agile work practices, agile mindset and teamwork quality, we believe that adopting agile work practices creates a foundation for improved teamwork through structured collaborative activities such as standups, sprint planning, and retrospectives. We hypothesize that the agile mindset serves as a partial mediator in the relationship between agile work practices and teamwork quality.

3 Research Question and Hypothesis

To guide our investigation, we formulated the following research question and derived the hypothesis based on the literature presented:

RQ: To what extent does the agile mindset explain variations in teamwork quality

associated with agile work practices among project/product team members?
H1: The positive association between agile work practices (AWPI) and teamwork quality (TWQ) is partially mediated by the agile mindset (AM).

4 Methodology

4.1 Research Design and Rationale

A quantitative empirical approach was employed to address the research question, using a cross-sectional design to collect data from October to December 20, 2024. It was chosen to provide generalizable statistical evidence for the mediation model. While previous research has explored the connection between agile work practices and the agile mindset using qualitative methods, there is a lack of quantitative evidence to verify and extend these findings. This approach involved collecting primary data through an online questionnaire. The survey was specifically targeted at professionals working in team environments using a range of methodologies, from traditional plan-driven approaches to agile practices. The use of an online platform facilitated broad accessibility and ensured the inclusion of a diverse sample, which was consistent with the study's goal of gaining insights beyond IT-specific contexts. The methodological framework was grounded in quantitative analysis, with structural equation modeling (SEM) used to test the formulated hypothesis, as preregistered.

To minimize potential language bias, the questionnaire was available only in English, ensuring consistency and reducing variability in responses due to language differences.

4.2 Participants and Procedure

Following the preregistration plan, we used a multi-source sampling approach to recruit a diverse group of individuals working in team settings. While agile originated in IT departments, its adoption has expanded across various organizational departments (Stettina and Knoop, 2024). Therefore, our sampling strategy targeted respondents from diverse departments to capture the broader adoption of agile work practices. The sampling strategy combined three channels. Primary recruitment through LinkedIn, utilizing both direct and public outreach, partnerships with two

corporations, and the online research platform CloudResearch Connect. We recruited a total of 597 participants to ensure achieving the targeted sample of 400 after accounting for anticipated dropouts and data cleaning. All participants were given the same online questionnaire, which will be detailed below and can be found in the Questionnaire Overview (Appendix).

Table 1

Sample Distribution

Subsample	Count
LinkedIn	219
Austrian Bank	3
IT Service Provider	4
Cloudresearch	200

4.2.1 Sample 1 - LinkedIn

The LinkedIn sample was obtained through direct outreach to network members and a campaign on research-related topics to expand participant reach. All participation was voluntary, the only compensation offered was an executive summary of the findings.

First, the recruiting strategy combined regular public posts with targeted posts in the LinkedIn ”group” feature to maximize algorithmic reach and engage specific professional communities. These groups, which users can manually join, serve as „a place for professionals in the same industry or with similar interests to share their insights and experiences, ask for guidance, and build valuable connections” (LinkedIn, 2024, para. 1). Secondly, we reached out to a total of 1596 LinkedIn Members in our network, asking for them to participate directly. With this approach, we were able to gain a combined 356 (n = 356) responses, with 219 finishing the study, resulting in a dropout rate of 38.5 %.

The average age of participants in the sample was approximately 40 (*SD* = 9.84) (List of Tables, Table 4), while we had 80 % male participants (Female = 18.05 %, Other = 2.44 %) (List of Tables, Table 6). With our sample being mainly from the IT-Department (75.61 %) (List of Tables, Table 7), an above average male population was anticipated, due to women only representing approximately 20 % of the IT

workforce across Europe (Statista, 2021). Participants had an average of 15 years of work experience (*SD* = 9.01), with approximately half that time, 7.27 years (*SD* = 4.76), spent working with agile methodologies. The average team size was 12.75 (*SD* = 14.06). Participants working in agile team settings reported mainly working with Scrum (30.45 %) or Kanban (22.91 %) (List of Tables, Table 9). With 27.24 % most of our participants reported to be “Agile Team Members” (List of Tables, Table 8). It is important to note that both the framework and role demographic variables were multiple choice questions, allowing participants to select multiple answers to fit their respective roles and individual teams.

As preregistered, we implemented a self-assessment (ASA) of the project management approach at the beginning of the study. The results showed that most participants in our sample worked in a hybrid manner, with 70.73 % identifying as either “mostly plan-driven” or “mostly agile”. This is in line with findings of Kuhrmann et al. (2022), who found that following a hybrid methodology is most common and only about 15 % follow a methodology completely. The sample included a very limited number of participants who described their team’s approach as purely plan-driven, with only four individuals recruited (List of Tables, Table 5).

4.2.2 Sample 2 – Company samples

We initiated a collaborative strategy by reaching out to a total of seven potential corporate partners. Even though all companies shared their interest, only three could engage in the study. The contact person of each remaining company was briefed on the content of the study. It should be noted that one company withdrew from the collaboration before data collection began due to the workload at the end of the year. The final group consisted of two organizations from different sectors and countries, an Austrian bank (AB) and a German IT service provider (ITSP).

A total of 13 participants (n(AB) = 4; n(ITSP) = 9) were acquired this way, of whom 7 (n(AB) = 3; n(ITSP) = 4) finished the study. Due to the limited and non-representative sample size, we will not report further descriptive statistics. However, all the descriptive statistics can be found in the Appendix (List of Tables, Table 1, 4, 5, 6, 7, 8, 9). The Austrian bank is publicly known for its agile approach, reflected in the ASA statistic, where all participants assessed their teams as agile.

Our contact person for the IT service provider mentioned that they mostly use a hybrid approach, depending on team leads and managers. This hybrid approach is also represented in the ASA.

4.2.3 Sample 3 – CloudResearch Connect

As our approach to collecting data with our LinkedIn sample seemed biased, we decided to gain another 200 (n = 200) participants via CloudResearch Connect. Connect is a crowdsourcing platform with the possibility to request a required demographic. We selected Connect over Prolific due to its ability to filter for the target demographic of project/product team members while maintaining comparable data quality standards when using screening filters (Peer et al., 2021). Each participant was compensated with 2£ for their participation.

We initially recruited 200 participants, of which 19 were excluded due to issues such as a lack of fit, time constraints, or straightlining. To compensate for these exclusions, Connect provided 19 replacement participants to maintain the intended sample size.

This sample showed an average age of 37.3 (*SD* = 10.06) (List of Tables, Table 4), similar to the LinkedIn sample. It also included a smaller male representation, accounting for 65.61 % (List of Tables, Table 6), which might be due to the broader distribution of departments, with only 40.74 % being from the IT Department (List of Tables, Table 7). The average work experience is similar to the LinkedIn sample with 14.40 (*SD* = 10.15) and about 7.52 (*SD* = 6.57) years of experience within an agile team environment (List of Tables, Table 4). The average team size was about 17, but the standard deviation of 44.85 caught our eye (List of Tables, Table 4).

We conducted a data inspection of participants with a team size value of above 100 to assess whether participants met our predefined inclusion criteria. Since indicators like averages, finishing duration, and straightlining were not conspicuous and did not deviate from the mean, we did not exclude participants from our analysis based on these criteria.

The most used framework in agile team settings was Scrum (20.75 %), followed by an individual approach (14.11 %) (List of Tables, Table 9). Unlike the

LinkedIn sample, the CloudResearch sample had project managers as the largest category of respondents at 27.98 % (List of Tables, Table 8).

The distribution of self-reported project management approaches (ASA) showed similar patterns to our LinkedIn sample, with 76.31 % of participants working in hybrid approaches combining traditional and agile methodologies. In this sample, we identified 31 participants (16.40 %) who reported working in purely traditional, plan-driven environments. (List of Tables, Table 5).

4.3 Measures

For assessing and answering the research question a total of five variables were needed. All variables and questions can be found in the Questionnaire Overview (Appendix). While all participants completed each measure, introducing potential common method bias, we counterbalanced the order of questions and presented the dependent variables first, following the recommendations of Podsakoff and colleagues (2003).

Participants' project management approaches were evaluated through a self-assessment of the team methodology in use. This approach was adopted from the Swiss Agile Study (Swiss Agile Research Network, 2018), where participants are required to rank their team's approach on a scale of 1 to 4 ("all plan-driven" to "all agile"). For the sake of simplicity, we decided to call it "Agile Self-Assessment" (ASA) in this paper. For clarity, each project management category in the questionnaire included a brief description to help participants who might not be familiar with different project management approaches.

Participants then completed Hoegl and Gemuenden's teamwork quality (TWQ) questionnaire (Hoegl et al., 2004), selected for its widely used application in different contexts and agile environments (Lindsjørn et al., 2016; Hoegl et al., 2004; Li et al., 2010). As the original study showed a relationship between teamwork quality and team performance, we also considered teamwork quality to be a proxy for team performance (Hoegl and Gemuenden, 2001). We chose the shortened version (Hoegl et al., 2004), to reduce fatigue and dropouts. All items were scored on a 5-point Likert scale (”strongly disagree” to ”strongly agree”) and showed high overall alpha values (α = .93) (List of Tables, Table 14). One example item would be ”There is intensive

communication within our team." To ensure consistency, we standardized the grammatical tense of the TWQ questions to the present tense, aligning all questionnaires, similar to Lindsjørn et al. (2016).

To assess the "Being Agile" dimension, we employed Eilers and colleagues' 20-item agile mindset (AM) questionnaire (Eilers et al., 2022). While their earlier work conceptualized "Being Agile" through psychological empowerment and individual characteristics (Eilers et al., 2020), their 2022 validated agile mindset scale represents a more robust measurement approach (Eilers et al., 2022). An example of an item would be: "I like making my work transparent for others." The response format was a 7-point Likert scale ("strongly disagree" to "strongly agree"), and the measure had high internal consistency (α = .92) (List of Tables, Table 14).

To examine the "Doing Agile" aspect, we utilized the agile work practices instrument (AWPI) developed by Junker and colleagues (Junker et al., 2023). The shortened questionnaire, consisting of 16 items, was chosen over other available options due to its general applicability across departments and agile frameworks. Junker and colleagues suggest a higher-order factor structure with two distinct second-order factors, namely agile taskwork and agile teamwork. While they found a marginally better fit with a two-factor model, we preregistered their single second-order factor structure, which aligned with our theoretical framework's focus on overall levels of agile work practices. We subsequently included their two-factor structure as part of our exploratory analysis. "We have a short meeting to discuss new developments in our tasks." is one example item of the questionnaire. The response format varied across the four factors, with "iterative development" and "sprints" assessed by a 7-point Likert scale to measure agreement ("strongly disagree" to "strongly agree"). Meanwhile, the factors "stand-up meetings" and "retrospectives" were assessed with a 7-point Likert scale to measure frequency ("almost never" to "daily").

Lastly, we asked for the sociodemographic information of our participants, specifically focusing on important aspects such as department, experience, and gender. In the case of participants working in an agile team, they were asked what frameworks their team implemented and what role they inherited. These were used as a descriptive measure to understand the possible limitations of our samples. As

mentioned, the variables “framework” and “agile roles” were both asked as multiple choice questions, as there are many hybrid roles in practice due to the hybrid or individual approaches within companies.

5 Results

The total sample, after controlling for outliers, consisted of 401 participants (*N* = 401; *n*(LI) = 212, *n*(CR) = 189) divided into two analytical groups, with the company samples (AB = 3, ITSP = 4) included in the LinkedIn sample, as the samples are too small to find a representative, generalizable results (see table 1). The company sample was merged with the LinkedIn dataset rather than the CloudResearch sample, as both the LinkedIn and company groups involved direct participant engagement and voluntary, unpaid participation.

Due to the cross-sectional research design, this is a purely correlational model. The theoretical framework indicates a causal direction, but the analyses should not be misinterpreted as evidence of causation.

In alignment with our preregistration, all data points used for the data analysis were mean-centered and standardized as recommended by Kleinbaum et al. (1988).

There are three main parts to the results section. First, all statistical assumptions necessary for the analyses were examined. Second, we conducted a scale comparison of our measurement instruments, specifically the agile work practices instrument (AWPI) and agile self-assessment (ASA) scales. Finally, we tested our hypothesis and conducted additional exploratory analyses. The exploratory analyses, while not pre-registered, aimed to control for measurement error and deepen our understanding of how specific agile work practices influenced the initial theoretical framework.

Table 2

Descriptive Statistics and Correlations of Main Variables

Variable	*M*	*SD*	1	2	3
1. Teamwork Quality	*3.96*	*0.62*			
2. Agile Mindset	*5.98*	*0.61*	.42***		
3. Agile Work Practices Instrument	*5.09*		.50***	.38***	

Note. $*p < .05.$ $**p < .01.$ $***p < .001.$

5.1 Assumption Testing

To ensure the validity of our analysis, we first addressed the required assumptions.

5.1.1 Outliers

As preregistered, we excluded values exceeding three standard deviations above or below the mean, though no such cases were found in the total sample. We applied additional outlier detection methods beyond the preregistered approach to further ensure data quality. Specifically, Mahalanobis distance (> 15) and Cook's distance (> 1) were applied as recommended by Field (2013). This conservative approach led to a total sample size of 401 participants (N = 401).

5.1.2 Linearity

The three main variables, AWPI, AM, and TWQ, showed moderate to strong correlations (see table 2). The scatterplots indicated strong linear relationships between the variables, with only a few observations falling outside the calculated prediction intervals, supporting the assumption of linearity (List of Figures, Figure 7). Almost all of the subfactors showed significant correlations with each other, as shown in table 3. The strongest correlations can be found between the subfactor iterative development (of the AWPI) and the subfactors of the TWQ. The AM subfactors of attitude towards self-guidance and collaborative exchange and the TWQ subfactors of communication and mutual support had the highest association between the constructs of agile mindset and teamwork quality. Between the higher-order constructs of the agile work practices instrument and the agile mindset, both iterative development and standup meetings showed the highest correlations to all subfactors of the AM, with collaborative exchange having the highest association with both practices (see table 3).

However, there were two notable exceptions to this pattern. First, the frequency of standup meetings (AWPI) showed no significant correlation with team cohesion (TWQ). Second, retrospectives (AWPI) showed a negative association with the attitude towards self-guidance and did not correlate significantly with any of the agile mindset subfactors (AM) (see table 3).

Table 3

Correlations Among Teamwork Quality, Agile Mindset, and Agile Work Practice Instrument Variables

	TWQ							AM					AWPI				
Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Communication	–																
2. Coordination	.67***	–															
3. Mutual Support	.70***	.63***	–														
4. Effort	.60***	.60***	.60***	–													
5. Balance	.55***	.61***	.59***	.75***	–												
6. Cohesion	.44***	.48***	.46***	.52***	.55***	–											
7. TWQ Total	.85***	.82***	.85***	.84***	.82***	.66***	–										
8. Self Guidance	.43***	.29***	.42***	.23***	.21***	.15**	.38***	–									
9. Customer Cocreation	.33***	.24***	.24***	.27***	.24***	.21***	.32***	.56***	–								
10. Learning Spirit	.32***	.24***	.31***	.25***	.22***	.18***	.32***	.71***	.54***	–							
11. Collaborative Exchange	.35***	.28***	.35***	.30***	.29***	.27***	.38***	.65***	.57***	.69***	–						
12. AM Total	.43***	.32***	.39***	.31***	.28***	.24***	.42***	.88***	.76***	.88***	.86***	–					
13. iterative development	.48***	.51***	.47***	.47***	.48***	.34***	.57***	.37***	.39***	.38***	.43***	.46***	–				
14. sprints	.22***	.24***	.22***	.23***	.23***	.20***	.28***	.16**	.25***	.20***	.26***	.25***	.37***	–			
15. standup meetings	.25***	.14**	.19***	.15**	.15**	.05	.20***	.31***	.28***	.37***	.38***	.39***	.23***	.36***	–		
16. retrospective	.21***	.27***	.15**	.32***	.32***	.29***	.31***	-.11*	.04	-.04	.07	-.02	.26***	.14**	.20***	–	
17. AWPI Total	.42***	.42***	.38***	.44***	.45***	.33***	.50***	.25***	.35***	.31***	.40***	.38***	.68***	.68***	.65***	.59***	–

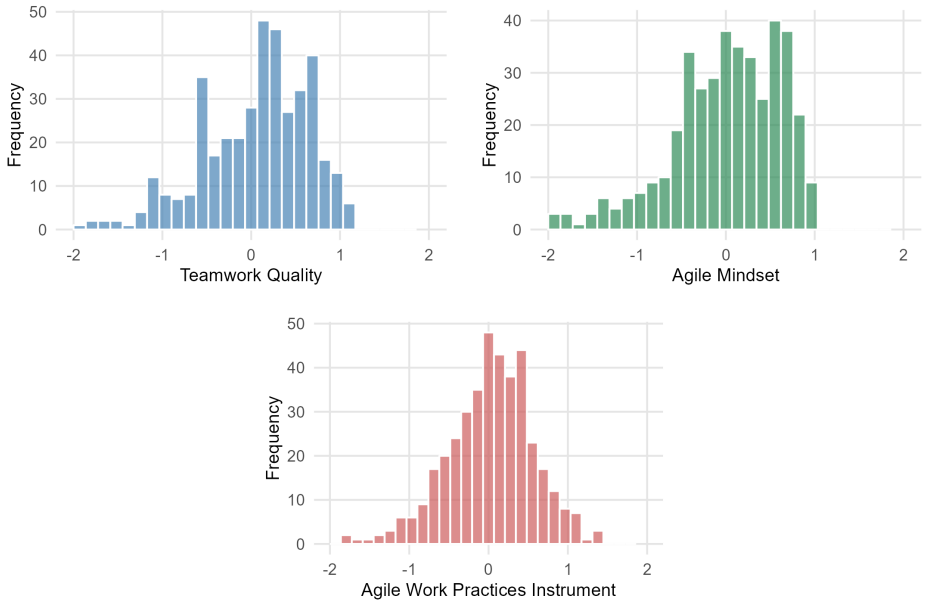
Note. $*p < .05$. $**p < .01$. $***p < .001$.

5.1.3 Distribution

While the histograms suggested a normal distribution, all Shapiro-Wilk tests showed significant results. (TWQ: W = .95, p < .001; AM: W = .95, p < .001; AWPI: W = .99, p < .001) (List of Tables, Table 10). Given the sensitivity of the Shapiro-Wilk test with large sample sizes, we also created Q-Q plots to examine skewness and kurtosis (List of Figures, Figure 8). All three variables exhibited negative skewness, likely due to ceiling effects observed in the histograms, particularly the ceiling effect of the agile mindset (see figure 2). Teamwork quality and the agile mindset exhibited a high kurtosis with heavy tails, especially on the lower end. We determined that both teamwork quality and the agile mindset were approximately normally distributed, however, we still used bootstrapping to calculate standard errors.

Figure 2

Distribution Assumption: Histograms of Variable Distribution



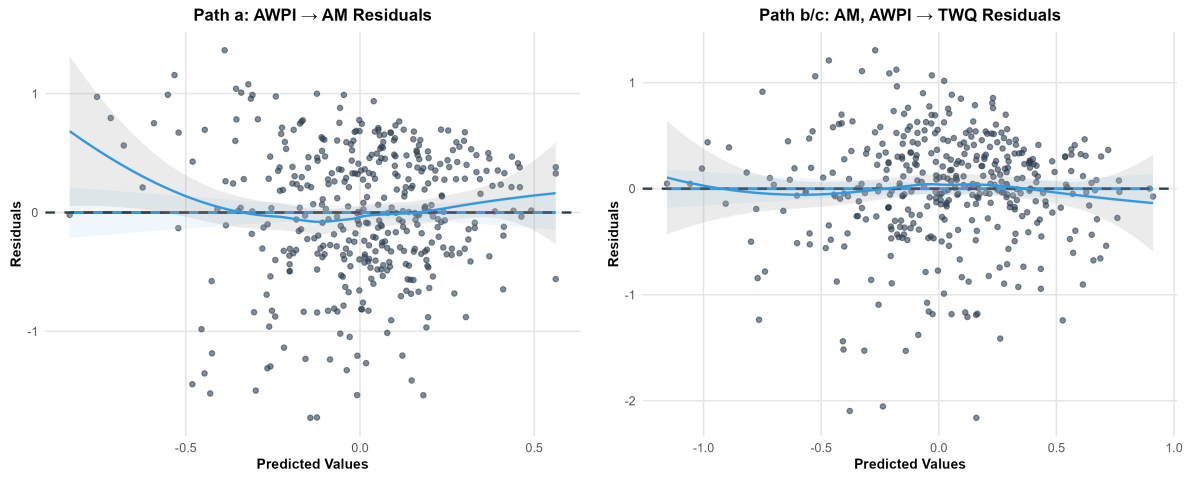
5.1.4 Homoscedasticity

To assess Homoscedasticity, we used residual plots. Both plots showed a slight funnel form, with a higher spread of residuals at the lower range of the predicted values (see figure 3). Although the funnel pattern appeared minimal, subsequent analysis using the Breusch-Pagan test indicated the presence of heteroscedasticity in our data (List of Tables, Table 11). To address this, we employed bootstrapping to

calculate robust standard errors. Regarding the homoscedasticity between the ASA and AWPI, both the boxplot (List of Figures, Figure 9) and the Levene test (F = 2.57, p = .054) exhibited homoscedasticity (List of Tables, Table 12).

Figure 3

Homoscedasticity Assumption: Residual plots (paths)



5.1.5 Multicollinearity

With a VIF below 10 (*VIF* = 1.17), multicollinearity was not a concern (List of Tables, Table 13).

5.1.6 Reliability

Cronbach's alpha and composite reliability were tested to assess internal consistency. With the exception of the "cohesion" subscale, all subscales had high alpha values that exceeded accepted thresholds, such as .7 suggested by Nunnally (Nunnally, 1978). (List of Tables, Table 14). The low alpha coefficient could be attributed to the subscale's brevity of only 2 items. The subscale's composite reliability (*CR* = .82) provided strong evidence of internal consistency, suggesting the low alpha was merely an artifact of the two-item structure.

5.2 Scale Comparison of ASA and AWPI

Following our preregistration plan, we implemented two different measurement approaches to assess the team's practices. The first approach used a direct

self-assessment measure (ASA), while the second used the agile work practices instrument (AWPI), which captures four practices through a higher-order factor structure. Through this measurement strategy, we aimed to validate the robustness of the approach and explore alternative ways to measure agile work practices. We were hoping to replicate the findings of Junker and colleagues (2023), but as the boxplots indicate, the AWPI and ASA did not match overall (see figure 4).

The original authors treated their 5-point scale (”traditional team” to ”agile team”) as metric, using a Pearson correlation, whereas we treated our ASA as a nominal scale. Contrary to the linear relationship between methodology assessment and AWPI scores reported, our data did not show the expected progressive increase across ASA categories (Junker et al., 2023).

To understand this misfit, we ran ANOVAs for the total sample (N = 401), the LinkedIn sample (n = 212), and the CloudResearch Sample (n = 189) (see figure 4). The total sample and LinkedIn sample revealed significant differences in AWPI scores across ASA levels (Total Sample: F = 8.02, p < .001, R^2 = .06; LI Sample: F = 13.2, p < .001, R^2 = .16; CR Sample: F = 2.64, p = .051, R^2 = .04) (List of Tables, Table 15).

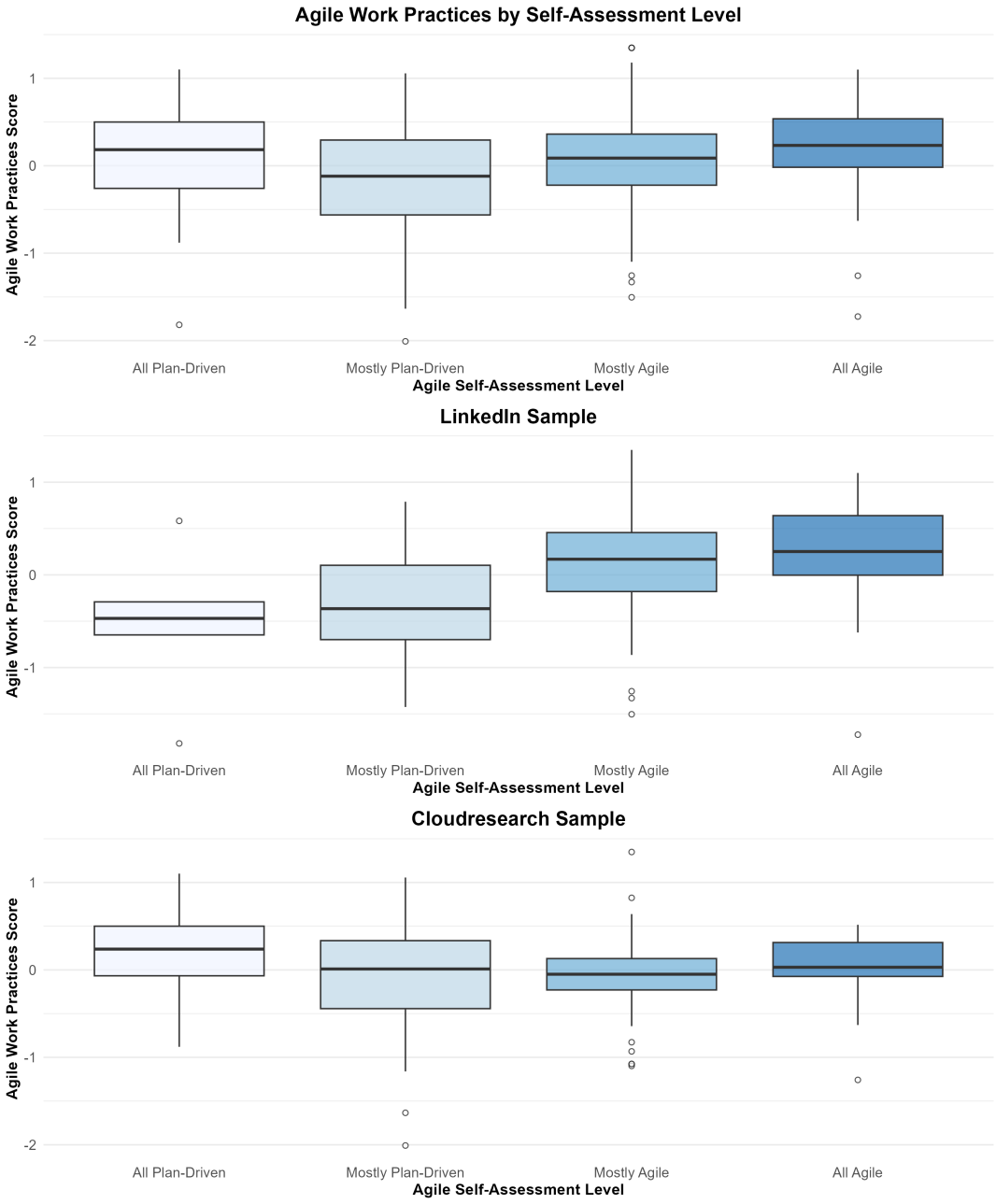
As a post-hoc test, we ran Tukey-Kramer, which revealed the inconsistency between samples (List of Tables, Table 16). The analysis of the LinkedIn sample revealed the expected positive increase of AWPI scores across ASA categories, with participants that identified their teams as ”mostly plan-driven” or higher showing increased AWPI scores. Both samples showed significantly higher scores in the ”mostly-” or ”all agile” categories than in the ”mostly plan-driven” category (”mostly agile” – ”mostly plan-driven”: p < .001; ”all agile” – ”mostly plan-driven”: p < .001) (see figure 4). The small sample size of the ”All plan-driven” group (n = 6) in the LinkedIn sample limits the interpretability of both the boxplot and the corresponding Tukey-Kramer analysis and will be ignored in the interpretation. Accordingly, the total sample shows higher AWPI scores in both the ”mostly agile” and ”all agile” groups (”mostly agile” – ”mostly plan-driven”: p < .005; ”all agile” – ”mostly plan-driven”: p = < .001) but also shows lower AWPI scores in ”mostly plan-driven” than ”all plan-driven” groups (”all plan-driven” – ”mostly-plan driven”: p = .03).

Following Junker et al.’s (2023) analytical approach, we conducted correlational analyses, which revealed weak but significant associations between ASA

and the overall AWPI score (r = .15, p < .01), sprints (r = .26, p < .001), standup meetings (r = .24, p < .001) and retrospectives (r = -.12, p < .05). This is similar to the results of Junker and his team, but not as strong as their results.

Figure 4

Boxplot of ASA and AWPI: Divided by Sample

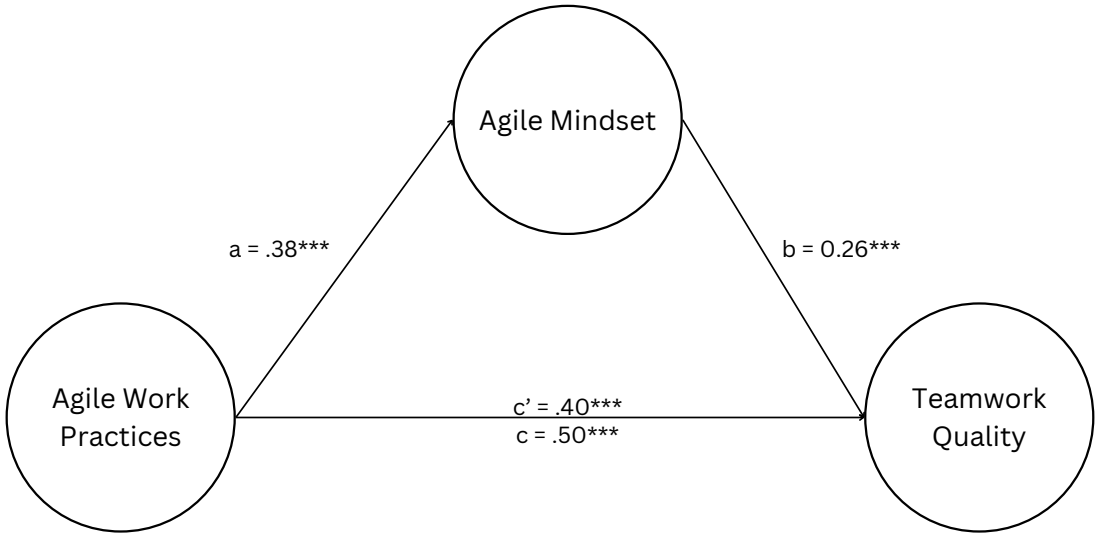


5.3 Mediation Analysis

The mediation analysis was conducted using the lavaan package in R, with bootstrapped standard errors to account for homoscedasticity and normality assumption violations. First, we tested the preregistered saturated model, showing a small, partial mediating effect of the agile mindset as seen in figure 5.

Figure 5

Saturated (Mediation) Model



Note. $*p < .05$. $**p < .01$. $***p < .001$.

The relationship between agile work practices and the agile mindset showed a medium effect size in our model (β = .38, f^2 = .17, p < .001). Further, the agile mindset shows a significant relationship with teamwork quality, when controlling for agile work practices (β = .26, p < .001), aligning with the findings of Stettina and Knoop (2024). Agile work practices showed both a strong relationship with (β = .40, p < .001) and without (β = .50, p < .001) the mediating effect of the agile mindset, indicating a partial mediation. Together, agile work practices and the agile mindset account for 31 % of the variance in teamwork quality, indicating a strong relationship (R^2 = .31) (List of Tables, Table 24). There was a small, significant indirect effect of the agile mindset (β = .1, p < .001), indicating that we can accept our hypothesis of a partial mediation (List of Tables, Table 18).

To validate our framework across samples, we conducted a multigroup analysis

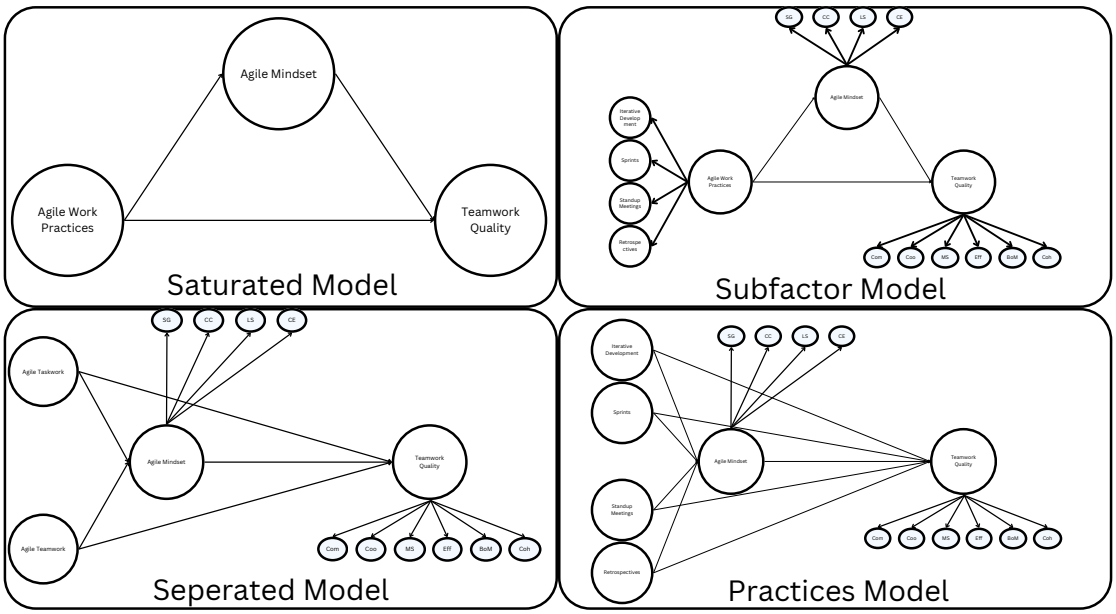
that was not preregistered (List of Figures, Figure 10). Both the LinkedIn and CloudResearch samples showed significant mediating effects of the agile mindset, although they differed significantly in the strength of this mediation (LI: indirect effect: β = .06, *p* = .005; CR: indirect effect: β = .30, *p* < .001). The CloudResearch data revealed stronger relationships between variables and a greater mediating effect of the agile mindset compared to the LinkedIn sample, as demonstrated by significantly higher path coefficients in the contrasts (path a: $\Delta\beta$ = -.22, *p* = .001; path b: $\Delta\beta$ = -.38, *p* = .007). Conversely, the opposite was shown for path c (path c: $\Delta\beta$ = .24, *p* = .001). No differences were found in the total relationship between agile work practices and teamwork quality. ($\Delta\beta$ = .00, *p* = .428) (List of Tables, Table 19).

5.4 Exploration

Before presenting our exploratory analyses, we acknowledge that our sample size limits the statistical power needed to confirm the observed differences between models. Therefore, the following results should be interpreted as preliminary findings and suggestions for further research.

Figure 6

Comparison of Multiple Models



Building on the mediation analysis, we explored alternative modeling approaches to address the methodological limitations of the saturated model. The initial use of aggregated item scores for mediation testing ignored potential measurement errors and increased the probability of a type-1 error. We developed the ”Subfactor Model” (top right) to address measurement error while maintaining model parsimony (detailed model: List of Figures, Figure 11). Rather than using individual items, we utilized subscales as indicators to achieve an optimal balance between model accuracy and complexity. When examining the model, we found that the previously significant relationship between agile mindset and teamwork quality disappeared (β = -.01, p = .865) (List of Tables, Table 20). This change resulted from structural weaknesses in the AWPI measurement model, where the sprints, standup meetings, and retrospectives components had poor factor loadings on the AWPI (Sp: β = .47, p < .001; SM: β = .40, p < .001; R: β = .32, p < .001). According to the literature, factor loadings should be above a threshold of .5 (Hair et al., 2006). This implies that the structural relationships in the AWPI become unstable in this model, meaning that they need to be assessed with more detailed structural assumptions, namely approaching the model with a different second-order structure or first-order structure.

Given that Junker et al.’s (2023) original design exhibited a better model fit with a two-factor structure, we adopted the ”Separated Model” (bottom left) (detailed model: List of Figures, Figure 12). Aligning with Uraon et al.’s (2024b) analytical approach, this model has two second-order factors, namely agile taskwork and agile teamwork. The results indicated that agile taskwork showed the expected mediation (β = .10, p < .001), while agile teamwork demonstrated no association with an agile mindset (β = .10, p = .084) and therefore no indirect effect (β = .03, p = .113) (List of Tables, Table 21).

To gain deeper insights into how specific agile work practices influence our theoretical framework, we developed the ”Practices Model” (bottom right) by treating each AWPI component as separate predictor variables (detailed model: List of Figures, Figure 13). This model further explains why agile taskwork and agile teamwork showed differing path coefficients to the agile mindset. While ”iterative development” revealed significant standardized path coefficients to the agile mindset

(β = .46, p < .001) and teamwork quality (β = .40, p < .001), ”sprints” did not show any association to the mediator (β = -.01, p = .825) or the dependent variable (β = .06, p = .234). The frequency of ”standup meetings” only exhibited a significant association with the agile mindset (β = .37, p < .001). On the contrary, the frequency of ”retrospectives” displayed a negative association with the agile mindset (β = -.22, p < .001) and a positive connection to teamwork quality (β = .25, p < .001), resulting in a minimal suppressing effect of the agile mindset (β = -.06, p < .001) (List of Tables, Table 22).

Following Hooper et al.’s (2007) established guidelines for fit indices, we conducted a comparison of the goodness/badness of fit indices to determine which structure best represented our data. Due to the aggregation of measurements in the Saturated Model, the fit indices calculated are perfect. Consequently, the model exhibits a perfect fit and low AIC and BIC values by default. To avoid confusion when comparing it to other models, we deleted these values from the table. The Subfactor Model, which showed a nonsignificant path b, can be rejected as most fit indices are below the acceptable thresholds (CFI: .896 < .9; TLI: .872 < .9; RMSEA: .098 > .08; SRMR: .071 < .08). Both the ”Separated Model” and ”Practices Model” showed acceptable fits, with only RMSEA showing slight deviations from the thresholds by Hooper et al. (2007) (RMSEA(Separated Model): .089 > .08; RMSEA(Separated Model): .082 > .08) (List of Tables, Table 23). As the Practices Model shows the best model fit apart from the Saturated Model, we will discuss its implications in the discussion section.

6 Discussion

6.1 Study Purpose and Summary

This research explored the relationship between agile work practices, the agile mindset, and teamwork quality across various organizational contexts. Our objective was to identify the factors that influence the relationship between agile work practices and teamwork quality. Specifically, we examined the role of the agile mindset and sought to determine the extent to which it accounts for variation in agile work practices associated with teamwork quality among project and product team members.

The increasing adoption of agile underscores the importance of identifying its

success factors as an area of research. As outlined in the introduction, the agile mindset has received considerable attention in recent years, highlighting its importance and exposing research gaps regarding its relationship to agile work practices and other factors that determine team success.

To investigate our research question, we conducted an online survey gathering data from 401 participants across multiple industries, roles, and project management approaches. Our theoretical framework proposed a mediation model comprising three higher-order factor constructs: the agile work practices instrument (AWPI), agile mindset (AM), and teamwork quality (TWQ).

The analysis supported the proposed theoretical framework, revealing a mediating effect of the AM on the positive relationship between AWPI and TWQ. Notably, iterative development stood out as the most influential practice, strongly interacting with the mediator and outcome variables, thus best exemplifying the hypothesized mediation structure. Unexpectedly, the frequency of retrospectives showed a negative association with the agile mindset but a positive link with teamwork quality, suggesting a suppressive effect of the agile mindset in this specific practice.

The multigroup analysis confirmed the robustness of the mediating effects across samples, although the strength of these effects appeared to vary, suggesting the influence of additional factors that require further research. The observed path associations were consistent across samples, showing positive connections between agile work practices, agile mindset, and teamwork quality. The relationship between AWPI and TWQ proved to be particularly robust, maintaining its significance across different analytical models and samples and highlighting the improvements in teamwork when agile work practices are applied.

Two significant measurement issues emerged during our analysis of the AWPI. The preregistered second-order factor structure did not fit our data as intended, suggesting that it oversimplified the data and compromised model parsimony. Instead, the best model fit, besides the saturated model, was found in the model where each practice was included separately. Additionally, our attempt to replicate previous findings by comparing the AWPI's higher-order factor structure with the self-assessment of project management approaches (ASA) was unsuccessful.

Overall, our findings highlighted the importance of AM as a mediator between

AWPI and TWQ. In the following sections, we will contextualize our findings within the existing literature and provide practical recommendations based on our interpretations of the results presented.

6.2 Theoretical Implications

6.2.1 Understanding the Mediation Framework: Path Dynamics and Implications

The discussion of theoretical implications regarding the mediation is structured in three parts: First, we examine the relationship between agile work practices and the agile mindset, comparing our results with existing literature. Second, we explore the interrelationship between the agile mindset and teamwork quality, elaborating on how specific attitudes and teamwork quality subfactors might interact. Finally, we analyze the relationship between agile work practices and teamwork quality, explaining the potential implications of the agile mindset. Despite the correlational nature of our study's findings, we explored potential path directions within the theoretical framework based on the existing literature.

In our theoretical background, we highlighted the historical interconnectedness of agile work practices and the agile mindset, showing how these constructs have evolved together over time. In scientific research, we found two primary approaches to understanding this relationship. Qualitative research (e.g., Sureshchandra and Shrinivasavadhani, 2008) has treated agile work practices and the agile mindset as distinct variables to be developed separately. However, quantitative research on similar constructs indicated a significant relationship between them (e.g., Uraon et al., 2024b; Malik et al., 2021), suggesting a potential interaction. Our results support this relationship but do not align with Stettina and Knoop (2024), who reported no relationship between agile work practices and agile mindset. We believe this difference is due to the inclusion of both traditional plan-driven and agile teams in our sample, which allowed for a more heterogeneous representation of agile work practices in our sample. Additionally, the discrepancy might stem from the different questionnaires used, as we used the AWPI, while Stettina and Knoop relied on So and Scholl's (2009) questionnaire.

The findings indicate, that the two facets of ”agile” should not be viewed as

separate components, as proposed by qualitative findings, but rather as an intertwined combination of cognitive processes and work practices. As proposed in our theoretical framework, we argue that by adopting agile work practices, teams can create a context associated with the development and adaptation of an agile mindset among individuals. However, we recognize that merely implementing a set of agile work practices might not automatically improve the agile mindset among team members.

The mediating effect of the agile mindset highlights the importance of psychological factors in team interactions. Our findings suggest that team members with a strong agile mindset demonstrate a more positive attitude toward collaboration, actively seek to improve their skills and take greater ownership of their work, thus showing more collaborative behaviors within the team.

Building on this understanding, the findings, including both the structural equation model and the subfactor correlations, support the positive relationship between agile mindset and teamwork quality identified by Stettina and Knoop (2024).

The proposed path direction implied by our theoretical framework is consistent with research by Brown (2003) and Dierdorff and Ellington (2012), who proposed that self-guidance enhances collective efficacy and team performance. We suggest that a high attitude towards self-guidance aligns with team members' willingness to show strong effort and commitment to the team, as reflected in the correlations between attitude towards self-guidance and all subfactors of teamwork quality.

In addition, ”attitude towards learning spirit” shows a positive association with teamwork quality (TWQ), supporting its role as a foundation for individual adaptations to achieve team goals. This openness to continuous learning, consistent with suggestions of Han et al. (2022), correlates primarily with mutual support among team members, laying the groundwork for effective collaboration.

Furthermore, we consider ”attitude towards collaborative exchange” to be the most critical aspect in the relationship between AM and TWQ. Our data replicated the correlational findings of Stettina and Knoop (2024) on this relationship, suggesting that a more positive attitude toward collaborative exchange is accompanied by an increase in the quality of interactions at the team level.

However, the relationship may be reciprocal, with teamwork quality potentially influencing individual attitudes toward collaboration, highlighting the complex interplay

between these variables. Similar to the conclusion of Han et al. (2022), these two constructs might interact dynamically, meaning they constantly improve each other without a clear path direction.

In the Introduction, we proposed that organizations tend to adopt agile work practices to improve team effectiveness but run the risk of underestimating the importance of the agile mindset. The findings demonstrated a robust relationship between AWPI and TWQ, even in cases where the agile mindset was not present, contradicting the statement and underscoring the complexity of the relationship. The robust results thus support the overall superiority of the application of agile work practices in terms of teamwork quality, as proposed similarly in previous literature (Lindsjørn et al., 2016; Serrador and Pinto, 2015).

Based on Hoehl et al. (2018), agile methodology was designed to improve working conditions and thus teamwork quality. As proposed by Pikkarainen et al. (2008), agile work practices should be seen as a context structure that increases communication. They increase the amount of interaction by adding routine structures such as daily standup meetings (Pikkarainen et al., 2008). Given the people-centric nature of agile, which relies on self-guided behavior and individual accountability within a team context, we believe that the individual attitudes of team members determine the quality of the interactions within those routine structures. Similarly, the application of agile work practices relates positively to team coordination, as these practices provide team members with regular opportunities to synchronize their tasks, which aligns with the findings reported by Strode et al. (2012). Our findings further indicate that the agile mindset mediates this relationship, suggesting that a more developed agile mindset is associated with more positive attitudes toward the synchronization process, potentially enhancing its effectiveness.

Based on the literature, we anticipated and found that using agile work practices would be positively related to the balance of member contributions. Consistent with the findings of McHugh et al. (2012), we attribute this result to the increased trust within agile teams due to the frequent interactions facilitated by agile working practices.

Both Dingsøyr and Lindsjørn (2013) and Strode et al. (2022) identified constructs similar to mutual support in their studies, which were positively associated

with the application of agile work practices that allocated dedicated time for collaboration. Similarly, our data shows that agile work practices were connected to mutual support and interpreted that they offer opportunities for team members to ask for help. We propose that increased time spent collaborating is associated with increased attitudes toward collaborative exchange, which in turn is associated with overall high levels of mutual support.

In line with Hoegl and Gemuenden's (2001) definition of "effort", we anticipate that consistent synchronization through agile work practices serves as both a motivational tool and a monitoring mechanism. This process helps team members maintain their effort levels in alignment with their teammates through accountability.

Aligning with our interpretation of the impact of agile work practices and the agile mindset on mutual support, we expect high levels of team cohesion to be achieved through regular collaboration. Likewise, Dingsøyr et al. (2016) believe that agile work practices serve as opportunities for organized collaborative activities and shared responsibility.

Overall, we propose that the agile mindset acts as a catalyst for successfully implementing agile work practices, ultimately enhancing teamwork quality within the theoretical framework. Agile work practices, in turn, cultivate essential psychological factors such as the agile mindset, empowerment, and trust, which collectively contribute to improved teamwork quality.

6.2.2 Generalizability of Results Across Different Samples

Our results showed that the mediation model was robust across samples, suggesting strong generalizability. However, we observed significant variability in the strength of path associations across samples. We employed a broad sampling strategy designed to capture a heterogeneous sample of project management approaches, reflecting the growing adoption of agile across different business disciplines and countries. This approach allowed us to match the scope of the research to the expanding reach of agile. Given the notable differences in sample composition, we have chosen to discuss these descriptive variations without conducting inferential tests to statistically evaluate them. Thus our interpretations should be viewed as exploratory and as potential inspiration for future research.

Agile team participants in the LinkedIn sample consisted primarily of agile team members in non-leadership roles, while the CloudResearch sample consisted primarily of project managers. This difference might have influenced the results, as project managers might have a more developed agile mindset due to their organizational responsibilities. Their greater involvement in practice implementation might also have led to more accurate AWPI responses. In addition, their ratings of TWQ might be more accurate due to their external perspective on the team. We propose that the roles held by participants might significantly influence the importance of the mediator. Specifically, the distinction between leadership and non-leadership roles could affect how the agile mindset mediates the relationship between agile work practices and teamwork quality.

The discrepancy in team sizes between samples is another important consideration. The CloudResearch sample reported larger mean team sizes with larger standard deviations. This could be due to project managers possibly aggregating multiple teams under their supervision, or larger teams might exhibit stronger mediating effects. However, the latter seems counterintuitive and contradicts the findings of Keshta and Morgan (2017), who suggest agile work practices are less suitable for larger teams. While our current findings do not allow us to draw any implications at this time, we recommend controlling for team size in the sampling approach for future research.

Geographic and cultural factors might also contribute to the observed differences. The CloudResearch sample was restricted to English-speaking countries (US, Australia, Canada, Ireland, New Zealand, and the United Kingdom), whereas the LinkedIn sample had no such restrictions. This difference in sample composition could introduce cultural and linguistic biases, potentially affecting the sensitivity of the mediation model.

Further, we anticipate that the application of agile might differ across departments, with some departments relying more on the mindset aspect of agile, while departments such as IT might rely more on the process aspect of agile. Future qualitative research could provide further insight into the differences between departments.

Our study highlights the benefits and challenges of broadening the scope of the

research by sampling across business departments, roles, and countries. On the one hand, it takes into account the broad applicability of agile, making the findings more generalizable. On the other hand, it introduces complexity that makes interpreting the results more challenging. Future research should consider these implications and use our findings as a foundation for further investigation.

6.2.3 Iterative Development & Retrospectives: Patterns with Teamwork Quality

The approach of integrating individual practices into the structural equation model provided valuable insights into the relationships between specific practices, the AM, and TWQ within a broader framework. By breaking down the model into individual components, we were able to find the strength of iterative development within the framework and identify contradictory findings regarding the frequency of retrospectives. These insights would not have been possible using a more aggregated approach.

The iterative development (ID) component of the AWPI emerged as particularly significant in the main findings. We interpret that ID most closely represents the principles of the agile mindset, thus exhibiting the strongest association with it. The ID questionnaire items, which focus on prototyping, exploring multiple approaches, and continuously refining ideas, align closely with the core principles outlined in the Agile Manifesto such as ”Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage.” (Beck et al., 2001, Twelve Principles of Agile Software, para. 2) or ”At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.” (Beck et al., 2001, Twelve Principles of Agile Software, para. 12). This alignment reflects the interlinked evolution of agile work practices and principles over time, which has been presented before. Abbas et al. (2008) note that iterative approaches predate the Agile Manifesto and played a substantial role in its development, suggesting that these iterative practices significantly influenced the principles that became codified in the manifesto. This historical significance of iterative development in shaping agile methodologies may explain its strong relationship with the agile mindset in our findings.

Practitioners often use the constructs of iterative development and sprints

interchangeably because of their common focus on adaptation and refinement through iteration. Both practices emphasize breaking projects into manageable parts and fostering adaptability through regular feedback loops. While they do share similar principles and often go hand in hand in practice, Junker et al. (2023) distinguish between the two, defining sprints as emphasizing the temporal aspect of iterative approaches, while iterative development focuses on the process of refinement and adaptation. Despite being similar, iterative development and sprints did not exhibit equally strong associations with AM or TWQ in our Practices model. Unexpectedly, sprints showed no significant correlation with either the mediator (AM) or the outcome (TWQ). This discrepancy could be because teams might implement sprints as a scheduling framework, without embracing their purpose for adaptation and learning. As a result, sprints might emphasize deadlines instead of flexibility, which might explain the lack of a significant correlation with either the agile mindset or teamwork quality.

The analysis revealed a contradictory relationship between retrospectives, teamwork quality, and agile mindset. While more frequent retrospectives correlated positively with teamwork quality, they showed a negative association with the agile mindset, suggesting a potential suppressor effect.

These results led to three possible interpretations. First, the frequency-based measurement approach might not have accurately captured the relationship between retrospectives and the agile mindset or teamwork quality. As retrospectives are typically held once per sprint, their frequency is often predefined by the sprint cycle (Schwaber and Sutherland, 2020). This predefined structure might limit the ability of the frequency measure to reflect how retrospectives relate to these constructs. The qualitative aspects of retrospectives, such as their content or team engagement, might play a more significant role than the sheer number of meetings. Second, the relationship between retrospective frequency and agile mindset development might follow a nonlinear pattern. Retrospectives might be positively related to the agile mindset at a certain optimal rate (e.g. monthly), but excessive frequency could lead to diminishing returns (e.g. daily). This non-linear relationship could explain why a higher frequency of retrospectives was associated with lower agile mindset scores in our study. Third, the value perception of retrospectives might play a crucial role in

their effectiveness. McHugh et al. (2012) found that while teams acknowledged the importance of retrospectives, they did not highly value these meetings. This aligns with our observation of retrospectives showing a positive association with teamwork quality but a negative link to the agile mindset. Team members might recognize the practical benefits of retrospectives for team coordination and performance, but may not perceive them as valuable, thus exhibiting a negative attitude towards these meetings.

Future research should focus on exploring the difference between frequency and general application of retrospectives to better understand how they are associated with an agile mindset.

6.2.4 Complications of Measuring Agile Work Practices

The analysis of the AWPI revealed several challenges that should be addressed in future research. Initially, the one second-order factor structure did not achieve the expected parsimony and should be applied cautiously in future studies. In simpler terms, this means that the proposed structure, which aimed to summarize multiple agile work practices into one overarching factor, proved less effective than expected and may have oversimplified the data. The reason might be the variation in scaling between these four subfactors. While the response format for iterative development and sprints asked for agreement (”strongly disagree” to ”strongly agree”), standup meetings and retrospectives asked for frequency (”almost never” to ”daily”).

To improve the one-second order factor structure, future research should consider measuring all factors using a consistent response format. This could lead to a better model fit, but it’s important to ensure that the scaling aligns with the measured theoretical factors. For example, using an agreement scale for standup meetings or a frequency scale for iterative development might not fit the intended theoretical construct, potentially affecting the scale’s validity. Answers to questions such as ”We have a short meeting to discuss new developments in our tasks.” (StM) have very different meanings depending on the scaling. Thus these questions would need specific time-oriented wording if the scaling asked for agreement: ”We [regularly] have short meetings to discuss new developments in our tasks.” Therefore, adopting a ”Practices Model” that integrates each practice into the model without relying on a

second-order factor might be the most appropriate approach for achieving a balanced level of parsimony.

Further, the ANOVA failed to replicate Junker and colleagues' (2023) reported linear relationship between the agile work practices instrument (AWPI) and a single-item self-assessment scale. The grouping approach used with the ASA revealed that the previously assumed linear relationship between ASA and AWPI scores was not supported by our data. We propose three factors that might explain this unexpected finding.

First, the ASA is a self-report scale, which directly asks how participants would rate their team's approach, while the AWPI measures the actual practice and frequency of used practices. Participants might have had different interpretations of what ”agile” means, going beyond the implementation of specific practices to include organizational or personal aspects. Similarly, Kuhrmann et al. (2022) argue that the issue of the mixed terminology of the “agile” umbrella term could lead to confusion regarding the perception of the used practices.

In addition, several practices commonly attributed to agile frameworks might also be found in traditional project management approaches. Teams might adopt practices, such as daily standup meetings, without necessarily identifying them as ”agile.” These practices might be implemented as an operational necessity, independent of the adoption of an agile framework. This independent usage of agile work practices is consistent with Kuhrmann et al.'s (2022) claim of terminology confusion in hybrid approaches, where teams combine practices without strict adherence to established frameworks like scrum.

This finding might also be attributed to the small proportion of plan-driven team members in the total sample (n = 36, ~10 % of participants). The representativeness of this group is limited due to the small sample size and might not be accurate for the population.

This combination of factors suggests that team members likely have different expectations of ”agile”, which presents a challenge when evaluating their approach through a self-assessment such as the ASA.

6.3 Practical Implications

6.3.1 The Agile Mindset as a Catalyst for Agile Teamwork Quality

Based on our theoretical framework and the interpretation of the data, we propose that the agile mindset acts as a catalyst that correlates with the effectiveness of agile work practices. Teams, where team members have strong attitudes towards adaptability, collaboration, and continuous improvement show stronger associations between agile work practices and positive outcomes in teamwork quality (List of Figures, Figure 5).

A prime example of this dynamic can be observed in sprint planning meetings, which are largely concerned with task selection. The effectiveness of these meetings seems to depend on the individual attitudes of the participants. The most important attitudes in this context are self-guidance and a positive attitude toward collaborative exchange. If team members are unwilling to actively participate in the selection of tasks and instead rely on external guidance, this might be associated with reduced productivity in these meetings. This lack of involvement could not only reduce their sense of ownership of the tasks but also it might foster a sense of wasted time, potentially leading to negative attitudes towards the meetings themselves. As a result, we argue that matching practice with attitudes might be essential to reach a high level of teamwork.

Since our measurement of the agile mindset was exclusively at the individual level, our recommendations target interventions aimed directly at individuals. Specifically, we suggest that organizations implement training programs and mentorships to help team members develop a deeper understanding of the agile principles and practices, and thus try to encourage the adoption of corresponding attitudes. For example, pairing new or less experienced team members with experienced agile practitioners in mentorship relationships might facilitate individual learning and support the development of an agile mindset.

To complement these individual-level interventions, we also recommend exploring complementary team-level approaches. Inspired by Pikkarainen et al. (2008), practitioners could use agile work practices to create environments that encourage informal discussions and collaborative problem-solving. In practice, this would mean enabling team members to openly discuss the agile work practices they

are using and to collectively establish team agreements. Such a bottom-up approach could empower individuals to actively shape team-level decisions. Agile coaches can support this process by providing guidance rather than direct instruction, thereby reinforcing team ownership.

Combining both individual-focused interventions and supportive team-level approaches might foster agile mindsets among team members, which could ultimately contribute to improved teamwork quality and performance.

6.3.2 The Attitudes of the Agile Mindset and their Link to Teamwork Quality: Self-Guidance and Collaborative Exchange

To provide more actionable insights for practitioners, we further explored the research model by incorporating each practice into the model and analyzing the correlations between the subfactors (see table 3).

When considering the reported correlations between subfactors, the attitude towards self-guidance and collaborative exchange (AM) showed the strongest relationships with communication and mutual support (TWQ), consistent with the findings of Stettina and Knoop (2024) (see table 3).

The attitude towards self-guidance is characterized by their attitudes to adjusting autonomously and taking responsibility. The findings suggest that teams with members who exhibit high attitudes towards self-guidance tend to show higher levels of communication and mutual support, which are critical components of overall teamwork quality.

Similarly, individuals within a team who score high on the attitude towards collaborative exchange, characterized by their openness in discussing tasks and dealing transparently with problems, also tend to exhibit higher overall teamwork quality. Specifically, they also perceived communication and mutual support within their team to be higher.

The overall high teamwork quality should also correlate with higher team performance as reported by Hoegl and Gemuenden (2001). For practitioners, we recommend focusing on developing both attitudes within their team members by using the previously recommended mentorship approach or establishing regular informal meetings, such as daily standups, which might improve these attitudes.

The attitudes toward customer co-creation and learning spirit also demonstrated significant correlations with teamwork quality, though their associations were slightly less pronounced compared to self-guidance and collaborative exchange. This finding aligns with the focus of teamwork quality on interactions within the team, which explains the weaker relationship with customer co-creation, a more externally oriented factor. However, this does not diminish the importance of customer co-creation for agile teams but rather underscores its indirect influence on internal team dynamics. Despite the slight differences in effect sizes, all four subfactors exhibited moderate to strong correlations with teamwork quality, emphasizing their collective importance. Given the strong interconnections among these attitudes, fostering one subfactor is likely to support a broader mindset change, ultimately enhancing teamwork quality.

From a teamwork quality perspective, communication and mutual support emerge as the subfactors most strongly correlated with the agile mindset, suggesting that these aspects of TWQ might benefit most from the presence of an agile mindset. The two factors show the strongest links to all four attitudes, consistent with the results of Stettina and Knoop (2024). Improving communication and mutual support should be the primary focus for practitioners at the team level. Creating an environment similar to an open office space, as described by Pikkarainen et al. (2008), is an effective way to improve communication within the team by encouraging informal interactions and regular synchronization without relying on scheduled meetings.

As presented earlier, AM and TWQ could share a dynamic relationship, where they influence one another. Therefore, we recommend focusing on the presented attitudes towards self-guidance and collaborative exchange (AM) and on the subfactors of communication and mutual support (TWQ) to dynamically improve team members attitudes and the overall quality of teamwork. New team members might benefit from strong communication within the team, which appears associated with a more positive attitude towards collaborative exchange while existing team members with a strong agile mindset might improve overall teamwork quality.

6.3.3 Iterative Development and Retrospectives as the Most Impactful Agile Work Practices

Based on the findings, we recommend prioritizing iterative development and retrospectives in practical application. Both practices demonstrated strong correlations with teamwork quality. In contrast, other practices, such as sprints and standup meetings, did not exhibit any significant connections to TWQ (List of Figures, Figure 13).

In addition to its association to TWQ, the results show that iterative development is strongly associated with an agile mindset in individuals, suggesting that the practice might help foster an adaptation of the mindset. ID emphasizes prototyping and experimenting with approaches prior to execution, encouraging team members to take ownership of the strategies employed. This sense of responsibility and accountability might be associated with enhanced attitudes towards collaborative exchange and self-guidance within the team. Similarly, the refining and adaptation process could be essential for building a mindset focused on continuous learning and fostering collaboration with customers to co-create value.

We recommend that practitioners guide teams by presenting specific practices that might facilitate a particular issue. Team members should then autonomously decide how to implement these practices into their existing work cycles, similar to the Spotify approach (Cruth, n.d.). For instance, when a marketing team considers iteratively refining content, the practitioner could highlight the benefits of this process, such as improved responsiveness to customer preferences. Next, the team should be encouraged to discuss and reflect on how they want to implement this approach in their daily workflow. This could involve deciding on strategies such as testing different versions of an online campaign, collecting user feedback through analytics, or refining content based on insights gained from user interactions and feedback loops. By involving the team in these decisions, they might cultivate aspects of an agile mindset, such as collaboration and self-guidance, but the extent of this involvement should be carefully aligned with the organization’s decision-making framework.

Our findings indicated a complex relationship between retrospectives and the agile mindset, as their effects appeared to be highly contextual. Despite this complexity, the frequency of retrospectives remained strongly associated with

improved teamwork quality. Therefore, we advocate a bottom-up approach to structuring such meetings. Rather than prescribing when and how retrospectives should be conducted, practitioners should capitalize on their team's expertise by dedicating a retrospective to evaluating meeting structures. Since meetings such as retrospectives and sprint planning are typically tied to sprint cycles, we recommend that practitioners openly discuss with their teams how and when these meetings should take place, giving team members the autonomy to evaluate and shape their own practices without necessarily handing over full decision-making authority.

Although not mentioned above, standup meetings showed a positive relationship with the agile mindset. Teams that hold standup meetings on a more regular basis, such as daily, seem to benefit from the consistent synchronization (List of Figures, Figure 13). These meetings integrate regular interaction into the team's daily routine, which might foster continuous learning and collaborative exchange. To maximize the impact of standup meetings, we recommend tailoring their content to address specific attitudes the team might be lacking. For instance, if a team struggles with collaboration or lacks a strong attitude toward collaborative exchange, practitioners could use standup meetings to encourage open, informal discussions about current challenges. This would create a space for team members to share updates, seek help, and align their efforts. Additionally, standup meetings could serve as a foundation for retrospectives by identifying discussion points. By aligning standup meetings and retrospectives, practitioners could be able to create a cohesive workflow where one meeting informs the other.

6.4 Limitations

The first limitation of this cross-sectional online survey design is its temporal constraint. While the framework presented suggests potential causal relationships, the correlational nature of our findings cannot make definitive causal statements. Therefore, all findings and conclusions should be considered as a basis for further research.

A further limitation is related to the sampling approach used. Due to the specific need for recruiting team-working individuals from diverse work environments, our possibilities for approaching potential participants were constrained.

We decided on directly contacting individuals on LinkedIn, which induced a self-selection bias on multiple levels, as participants had to be LinkedIn Members, be connected to the research team, and be interested in participating. Consequently, the findings might be automatically biased, as individuals who chose to participate might differ systematically from those who declined. This sampling approach prevented us from identifying possible team and organizational affiliations, making it impossible to conduct multilevel analyses of nested data structures. Targeting entire teams or organizations would have given us this opportunity and should be considered in future research. Another limitation of our LinkedIn sample was the lack of participants from purely plan-driven teams, which might be explained by two factors. The self-selection bias inherent in our LinkedIn recruitment strategy likely biased the sample toward participants already working in agile teams, as the research team's professional network might have contained a disproportionate number of connections from agile backgrounds. Another aspect is the current market reality, particularly given that approximately 80 % of the participants worked in IT departments where agile is prevalent. The logical conclusion is the asymmetric grouping. Using a quota sampling method, we could have reached a more balanced grouping, though we did not expect that we would only reach four participants who consider their team ”all plan-driven”.

The use of CloudResearch Connect introduced differences in our sampling approach, as these participants were compensated for their participation, recruited from only six countries, and exhibited distinct demographic characteristics, thereby limiting the generalizability of the findings. To address this limitation, we utilized the multigroup approach, however, the significant differences between paths indicate the need for further research. Another implication of using Connect for our sampling is the team size. The high variance in reported team sizes might be attributed to participants' organizational roles, particularly among project managers who comprised 30 % of those in agile positions. For instance, one program manager contacted us directly to clarify whether they should have aggregated the sizes of all teams under their supervision, suggesting that others in similar positions might have done the same. He added the teams together, which ended up being over 110 people, which could explain these high standard deviations.

The third limitation stems from the study's reliance on self-report measures. All

constructs, including teamwork quality, agile mindset, and the implementation of agile work practices, were assessed through self-report questionnaires. This approach prevents us from objectively evaluating these aspects, as self-report data can be influenced by various factors, such as social desirability bias, recall bias, and subjective interpretations of the questions. This is specifically problematic when looking at the results of the scale comparison. The research design does not allow us to identify the source of the unexpected findings in said comparison. Multiple factors could explain the divergence, including participants' incomplete understanding of their team's approach, the limited representation of certain methodological categories in our sample, or other unmeasured variables that might influence the relationship.

Another aspect to consider is the measurement challenges we faced with the AWPI. To address these issues, we explored different structural equation models that allowed us to account for certain limitations in the measurement approach. However, the low factor loadings observed undermine the otherwise high robustness of our main findings in the results section, highlighting the need for further replication to validate these outcomes. In addition, the measurement challenge and scale comparison highlights the complexity of assessing agile work practices in a non-IT research context.

Lastly, the already mentioned common method bias has to be taken into account. All participants answered both the dependent, as well as the independent variables, leading to a higher common method bias. In addition, both the agile mindset and agile work practices instrument were scaled on a Likert scale of seven, which might induce anchoring effects (Podsakoff et al., 2003). To encounter this bias, we chose the preregistered counterbalancing method, used different scale headings, and chose simple, easily understandable scales. Further, the anonymity of the participants was mentioned multiple times to reduce possible effects of social desirability.

6.5 Future research

For future research directions, beyond the previously mentioned aspects, we propose extending the presented approach by recruiting entire teams and incorporating a longitudinal approach. Similar to the study by Peeters and colleagues (2022) future research should concentrate on whole teams. Thus, a multi-level

approach should be taken and all three variables should be measured at the team level. Accordingly, the agile mindset could be measured by averaging scores across team members. Using this approach, one could find out if a ”Group Shared Agile Mindset” can be measured, similar to the approach of Dierdorff and Ellington (2012) or Han et al. (2022). The discrepancy between perceived methodology (ASA) and actual practice (AWPI) could be addressed similarly by expanding data collection to include either full team assessments or independent assessments by project managers and agile coaches. If a third party is involved, consideration could also be given to testing the variable of team performance via the project manager, which would be consistent with other approaches tested in the IMO framework mentioned in the introduction (Mathieu et al., 2008). This variable would be less biased if assessed by a third party such as the project manager. Future research should consider incorporating team development over time as an additional variable in the theoretical framework. Drawing from Ilgen’s ”Input-Mediator-Output-Input” framework (2005), we suggest iteratively assessing the mediator variable through a longitudinal study of teams undergoing agile transformations. By periodically measuring our proposed framework, such a design would allow for the capture of causal effects that our cross-sectional approach could not. In addition, the implementation of specific interventions could be integrated into the model as a moderator of the relationship between agile work practices and the agile mindset, resulting in a moderated mediation model that accounts for interventions.

7 Conclusion

The present study aimed to answer the research question of the extent to which the agile mindset explains variations in the relationship between teamwork quality and agile work practices among project and product team members. Cross-sectional data was collected from 401 experienced professionals through an online questionnaire. Participants had an average of approximately 15 years of professional experience and were sampled from three different sources. Following the broad implementation of agile across different departments and countries, we expanded the scope of the research to include members from diverse organizational teams.

In the introduction, a theoretical framework was presented that positioned the

agile mindset as a mediator in the relationship between agile work practices and teamwork quality. The results validated this framework and showed that agile work practices were positively associated with teamwork quality, with team members' agile mindset acting as the anticipated mediator. With our multigroup approach, we were able to confirm the robustness of our findings across differing samples. We interpreted that the agile mindset acts as a catalyst, amplifying the positive relationship of agile work practices and teamwork quality.

The attitudes of the agile mindset, particularly those related to self-guidance and collaborative exchange, demonstrated the strongest associations with teamwork quality. These attitudes were strongly correlated with the communication and mutual support factors of the teamwork quality construct. This suggests that fostering an agile mindset and emphasizing these specific attitudes could lead to higher levels of teamwork quality.

Among the agile work practices examined, iterative development and retrospectives exhibited the strongest associations with teamwork quality. However, while iterative development and stand-up meetings also showed positive associations with the agile mindset, retrospectives showed a negative association. From these conflicting findings, we interpreted that an iterative approach could support the development of an agile mindset and lead to improved teamwork quality, while retrospectives need to be used with care due to their potential negative effect on the agile mindset. We found daily standup meetings to be a potential tool for fostering said mindset.

Based on the findings, we may conclude that neglecting the agile mindset will limit the effectiveness of agile work practices, as individual team members may be less receptive to adopting and internalizing these practices.

References

Abbas, N., Gravell, A. M., & Wills, G. B. (2008). Historical roots of agile methods: Where did “agile thinking” come from? *Agile Processes in Software Engineering and Extreme Programming: 9th International Conference. Proceedings 9*, 94–103. https://doi.org/10.1007/978-3-540-68255-4_10

Agile Scrum Group. (n.d.). Doing Agile vs. Being Agile [Retrieved July 24, 2024]. https://agilescrumgroup.de/doing-agile-vs-being-agile/

Beck, K. (2000). *Extreme programming explained: Embrace change*. Addison-Wesley.

Beck, K., Beedle, M., van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., Grenning, J., Highsmith, J., Hunt, A., Jeffries, R., Kern, J., Marick, B., Martin, R. C., Mellor, S., Schwaber, K., Sutherland, J., & Thomas, D. (2001). Manifesto for agile software development [Retrieved June 13, 2024]. https://agilemanifesto.org/

Bennett, N., & Lemoine, G. J. (2014). What a difference a word makes: Understanding threats to performance in a VUCA world. *Business Horizons*, *57*(3), 311–317. https://doi.org/10.1016/j.bushor.2014.01.001

Brown, T. C. (2003). The effect of verbal self-guidance training on collective efficacy and team performance. *Personnel Psychology*, *56*(4), 935–964. https://doi.org/10.1111/j.1744-6570.2003.tb00245.x

Coman, I. D., Robillard, P. N., Sillitti, A., & Succi, G. (2014). Cooperation, collaboration and pair-programming: Field studies on backup behavior. *Journal of Systems and Software*, *91*, 124–134. https://doi.org/10.1016/j.jss.2013.12.037

Conforto, E. C., Amaral, D. C., Da Silva, S. L., Di Felippo, A., & Kamikawachi, D. S. L. (2016). The agility construct on project management theory. *International*

Journal of Project Management, *34*(4), 660–674. https://doi.org/10.1016/j.ijproman.2016.01.007

Cruth, B. M. (n.d.). The Spotify model for scaling Agile [Retrieved: February 11, 2025]. https://www.atlassian.com/agile/agile-at-scale/spotify

Dierdorff, E. C., & Ellington, J. K. (2012). Members matter in team training: Multilevel and longitudinal relationships between goal orientation, self-regulation, and team outcomes. *Personnel Psychology*, *65*(3), 661–703. https://doi.org/10.1111/j.1744-6570.2012.01255.x

Dikert, K., Paasivaara, M., & Lassenius, C. (2016). Challenges and success factors for large-scale agile transformations: A systematic literature review. *Journal of Systems and Software*, *119*, 87–108. https://doi.org/10.1016/j.jss.2016.06.013

Dingsøyr, T., Fægri, T. E., Dybå, T., Haugset, B., & Lindsjørn, Y. (2016). Team performance in software development: Research results versus agile principles. *IEEE software*, *33*(4), 106–110. https://doi.org/10.1109/MS.2016.100

Dingsøyr, T., & Lindsjørn, Y. (2013). Team performance in agile development teams: Findings from 18 focus groups. *Agile Processes in Software Engineering and Extreme Programming: 14th International Conference, XP 2013. Proceedings 14*, 46–60. https://doi.org/10.1007/978-3-642-38314-4_4

Dingsøyr, T., Nerur, S., Balijepally, V., & Moe, N. B. (2012). A decade of agile methodologies: Towards explaining agile software development. *Journal of Systems and Software*, *85*(6), 1213–1221. https://doi.org/10.1016/j.jss.2012.02.033

Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random house.

Dybå, T., & Dingsøyr, T. (2008). Empirical studies of agile software development: A systematic review. *Information and Software Technology*, *50*(9), 833–859. https://doi.org/10.1016/j.infsof.2008.01.006

Eilers, K., Peters, C., & Leimeister, J. M. (2022). Why the agile mindset matters. *Technological Forecasting and Social Change*, *179*. https://doi.org/10.1016/j.techfore.2022.121650

Eilers, K., Simmert, B., & Peters, C. (2020). Doing agile vs. being agile - understanding their effects to improve agile work.

Field, A. (2013). *Discovering statistics using IBM SPSS Statistics*. SAGE.

Gandomani, T. J., Zulzalil, H., Ghani, A., Sultan, A. B. M., & Sharif, K. Y. (2014). How human aspects impress agile software development transition and adoption. *International Journal of Software Engineering and its Applications*, *8*(1), 129–148.

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. *Administrative Science Quarterly*, 499–517. https://doi.org/10.2307/2392936

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis (vol. 6)*. Upper Saddle River, NJ: Pearson Prentice Hall.

Han, S. J., Xie, L., Beyerlein, M., & Boehm, R. (2022). Examining the mediating role of team growth mindset on the relationship of individual mindsets and shared leadership. *European Journal of Training and Development*, *48*(1), 234–252. https://doi.org/10.1108/EJTD-08-2022-0084

Highsmith, J., & Cockburn, A. (2001). Agile software development: The business of innovation. *Computer*, *34*(9), 120–127. https://doi.org/10.1109/2.947100

Hoegl, M., & Gemuenden, H. G. (2001). Teamwork quality and the success of innovative projects: A theoretical concept and empirical evidence. *Organization Science*, *12*(4), 435–449. https://doi.org/10.1287/orsc.12.4.435.10635

Hoegl, M., Weinkauf, K., & Gemuenden, H. G. (2004). Interteam coordination, project commitment, and teamwork in multiteam r&d projects: A longitudinal study. *Organization Science*, *15*(1), 38–55. https://doi.org/10.1287/orsc.1030.0053

Hohl, P., Klünder, J., van Bennekum, A., Lockard, R., Gifford, J., Münch, J., Stupperich, M., & Schneider, K. (2018). Back to the future: Origins and directions of the “agile manifesto”–views of the originators. *Journal of Software Engineering Research and Development*, *6*, 1–27. https://doi.org/10.1186/s40411-018-0059-z

Hooper, D., Coughlan, J., & Mullen, M. (2007). Structural equation modeling: Guidelines for determining model fit. *The Electronic Journal of Business Research Methods*, *6*(1), 53–60.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology*, *56*, 517–543. https://doi.org/10.1146/annurev.psych.56.091103.070250

Junker, T. L., Bakker, A. B., Derks, D., & Molenaar, D. (2023). Agile work practices: Measurement and mechanisms. *European Journal of Work and Organizational Psychology*, *32*(1), 1–22. https://doi.org/10.1080/1359432X.2022.2096439

Junker, T. L., Bakker, A. B., Gorgievski, M. J., & Derks, D. (2022). Agile work practices and employee proactivity: A multilevel study. *Human Relations*, *75*(12), 2189–2217. https://doi.org/10.1177/00187267211030101

Keshta, N., & Morgan, Y. (2017). Comparison between traditional plan-based and agile software processes according to team size & project domain (a systematic literature review). *8th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)*, 567–575. https://doi.org/10.1109/IEMCON.2017.8117128

Kleinbaum, D. G., Kupper, L. L., Muller, K. E., & Nizam, A. (1988). *Applied regression analysis and other multivariable methods* (Vol. 601). Duxbury press Belmont, CA.

Klünder, J., Trommer, F., & Prenner, N. (2022). How agile coaches create an agile mindset in development teams: Insights from an interview study. *Journal of Software: Evolution and Process*, *34*(12). https://doi.org/10.1002/smr.2491

Koch, J., & Schermuly, C. C. (2021). Who is attracted and why? How agile project management influences employee's attraction and commitment. *International Journal of Managing Projects in Business*, *14*(3), 699–720. https://doi.org/10.1108/IJMPB-02-2020-0063

Kozlowski, S. W., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest*, *7*(3), 77–124. https://doi.org/10.1111/j.1529-1006.2006.00030.x

Krasteva, I. (2022). Doing Agile vs. Being Agile in 2022: Why it matters [Retrieved July 24, 2024]. *Businessmap*. https://businessmap.io/blog/doing-agile-vs-being-agile

Kuhrmann, M., Tell, P., Hebig, R., Klünder, J., Münch, J., Linssen, O., Pfahl, D., Felderer, M., Prause, C. R., MacDonell, S. G., Nakatumba-Nabende, J., Raffo, D., Beecham, S., Tüzün, E., López, G., Paez, N., Fontdevila, D., Licorish, S. A., Küpper, S., … Richardson, I. (2022). What makes agile

software development agile? *IEEE Transactions on Software Engineering*, *48*(9), 3523–3539. https://doi.org/10.1109/TSE.2021.3099532

Li, Y., Chang, K.-C., Chen, H.-G., & Jiang, J. J. (2010). Software development team flexibility antecedents. *Journal of Systems and Software*, *83*(10), 1726–1734. https://doi.org/10.1016/j.jss.2010.04.077

Lindsjørn, Y., Sjøberg, D. I., Dingsøyr, T., Bergersen, G. R., & Dybå, T. (2016). Teamwork quality and project success in software development: A survey of agile development teams. *Journal of Systems and Software*, *122*, 274–286. https://doi.org/10.1016/j.jss.2016.09.028

LinkedIn. (2024). Linkedin groups membership [Retrieved December 26, 2024]. https://www.linkedin.com/help/linkedin/answer/a540824

Magni, M., Palmi, P., & Salvemini, S. (2018). Under pressure! Team innovative climate and individual attitudes in shaping individual improvisation. *European Management Journal*, *36*(4), 474–484. https://doi.org/10.1016/j.emj.2017.07.009

Malik, M., Sarwar, S., & Orr, S. (2021). Agile practices and performance: Examining the role of psychological empowerment. *International Journal of Project Management*, *39*(1), 10–20. https://doi.org/10.1016/j.ijproman.2020.09.002

Malone, T. W., & Crowston, K. (1994). The interdisciplinary study of coordination. *ACM Computing Surveys (CSUR)*, *26*(1), 87–119. https://doi.org/10.1145/174666.174668

Mathieu, J., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management*, *34*(3), 410–476. https://doi.org/10.1177/0149206308316061

McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, *52*(1), 81–90. https://doi.org/10.1037/0022-3514.52.1.81

McHugh, O., Conboy, K., & Lang, M. (2012). The impact of agile practices on trust in software project teams. *IEEE Software*. https://doi.org/10.1109/MS.2011.118

Melo, C. d. O., Cruzes, D. S., Kon, F., & Conradi, R. (2013). Interpretative case studies on agile team productivity and management. *Information and Software Technology*, *55*(2), 412–427. https://doi.org/10.1016/j.infsof.2012.09.004

Miler, J., & Gaida, P. (2019). On the agile mindset of an effective team–an industrial opinion survey. *2019 Federated Conference on Computer Science and Information Systems (FedCSIS)*, 841–849. https://doi.org/10.15439/2019F198

Mordi, A., & Schoop, M. (2020). Making it tangible - creating a definition of agile mindset. *Twenty-Eigth European Conference on Information Systems (ECIS2020)*.

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005). Challenges of migrating to agile methodologies. *Communications of the ACM*, *48*(5), 72–78. https://doi.org/10.1145/1060710.1060712

Neumann, M., Kuchel, T., Diebold, P., & Schön, E.-M. (2024). Agile culture clash: Unveiling challenges in cultivating an agile mindset in organizations. *ArXiv Preprint*. https://doi.org/10.48550/arXiv.2405.15066

Nunnally, J. C. (1978, January). *Psychometric theory*. McGraw-Hill Companies.

Olszewska, M., Heidenberg, J., Weijola, M., Mikkonen, K., & Porres, I. (2016). Quantitatively measuring a large-scale agile transformation. *Journal of Systems and Software*, *117*, 258–273. https://doi.org/10.1016/j.jss.2016.03.029

Oprins, R. J., Frijns, H. A., & Stettina, C. J. (2019). Evolution of scrum transcending business domains and the future of agile project management. *Agile Processes in Software Engineering and Extreme Programming: 20th International Conference, XP 2019, Proceedings 20*, 244–259. https://doi.org/10.1007/978-3-030-19034-7_15

Ozkan, N., Eilers, K., & Gök, M. Ş. (2023). Back to the essential: A literature-based review on agile mindset. *18th Conference on Computer Science and Intelligence Systems (FedCSIS)*, 201–211. https://doi.org/10.15439/2023F6360

Ozkan, N., Eilers, K., & Gök, M. Ş. (2024). A literature review based insight into agile mindset through a lens of six c's grounded theory model. *Information Technology for Management: Solving Social and Business Problems Through IT*, *504*, 261–282. https://doi.org/10.1007/978-3-031-61657-0_13

Peer, E., Rothschild, D., Gordon, A., Evernden, Z., & Damer, E. (2021). Data quality of platforms and panels for online behavioral research. *Behavior Research Methods*, *54*(4), 1643–1662. https://doi.org/10.3758/s13428-021-01694-3

Peeters, T., Van De Voorde, K., & Paauwe, J. (2022). The effects of working agile on team performance and engagement. *Team Performance Management: An International Journal*, *28*(1), 61–78. https://doi.org/10.1108/TPM-07-2021-0049

Pikkarainen, M., Haikara, J., Salo, O., Abrahamsson, P., & Still, J. (2008). The impact of agile practices on communication in software development. *Empirical Software Engineering*, *13*, 303–337. https://doi.org/10.1007/s10664-008-9065-9

Pinto, M. B., & Pinto, J. K. (1990). Project team communication and cross-functional cooperation in new program development. *Journal of Product Innovation Management*, *7*(3), 200–212. https://doi.org/10.1111/1540-5885.730200

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Rigby, D. K., Sutherland, J., & Takeuchi, H. (2016). Embracing agile [Retrieved July 15, 2024]. https://hbr.org/2016/05/embracing-agile

Sathe, C. A., & Panse, C. (2022). Analyzing the impact of agile mindset adoption on software development teams productivity during covid-19. *Journal of Advances in Management Research*, *20*(1), 96–115. https://doi.org/10.1108/JAMR-05-2022-0088

Schwaber, K. (1997). Scrum development process. *Business Object Design and Implementation*, 117–134. https://doi.org/10.1007/978-1-4471-0947-1_11

Schwaber, K., & Sutherland, J. (2020). The scrum guide: The definitive guide to scrum: The rules of the game. https://www.scrum.org/resources/scrum-guide

Scrum Alliance. (2013). The state of scrum: Benchmarks and guidelines [Retrieved September 4, 2024]. https://resources.scrumalliance.org/

Serrador, P., & Pinto, J. K. (2015). Does agile work?—a quantitative analysis of agile project success. *International Journal of Project Management*, *33*(5), 1040–1051. https://doi.org/10.1016/j.ijproman.2015.01.006

So, C., & Scholl, W. (2009). Perceptive agile measurement: New instruments for quantitative studies in the pursuit of the social-psychological effect of agile practices. *Agile Processes in Software Engineering and Extreme Programming*, *31*, 83–93. https://doi.org/10.1007/978-3-642-01853-4_11

Statista. (2021). Female representation in technology organizations in 2021, by selected countries [Retrieved January 26, 2025]. https: //www.statista.com/statistics/1256204/representation-of-gender-tech-by-cou

Stettina, C. J., & Knoop, M. A. (2024). Scrumming frontiers: Agile frameworks across business disciplines outside of IT, and the impact of agile mindset on team performance. *2024 IEEE International Conference on Engineering, Technology, and Innovation (ICE/ITMC)*, 1–9. https://doi.org/10.1109/ICE/ITMC61926.2024.10794343

Stettina, C. J., van Els, V., Croonenberg, J., & Visser, J. (2021). The impact of agile transformations on organizational performance: A survey of teams, programs and portfolios. *International Conference on Agile Software Development*, 86–102. https://doi.org/10.1007/978-3-030-78098-2_6

Stewart, G. L., Fulmer, I. S., & Barrick, M. R. (2005). An exploration of member roles as a multilevel linking mechanism for individual traits and team outcomes. *Personnel Psychology*, *58*(2), 343–365. https://doi.org/10.1111/j.1744-6570.2005.00480.x

Strode, D. E., Dingsøyr, T., & Lindsjorn, Y. (2022). A teamwork effectiveness model for agile software development. *Empirical Software Engineering*, *27*(56). https://doi.org/10.1007/s10664-021-10115-0

Strode, D. E., Huff, S. L., Hope, B., & Link, S. (2012). Coordination in co-located agile software development projects. *Journal of Systems and Software*, *85*(6), 1222–1238. https://doi.org/10.1016/j.jss.2012.02.017

Sureshchandra, K., & Shrinivasavadhani, J. (2008). Moving from waterfall to agile. *Agile 2008 Conference*, 97–101. https://doi.org/10.1109/Agile.2008.49

Swiss Agile Research Network. (2018). Swiss agile study [Retrieved July 26, 2024]. https://swissagileresearchnetwork.ch/?page_id=146

Uraon, R. S., Bharati, R., Sahu, K., & Chauhan, A. (2024a). Agile work practices and team creativity: The mediating role of team efficacy. *Journal of Organizational Effectiveness: People and Performance*, *11*(2), 500–521. https://doi.org/10.1108/JOEPP-04-2023-0115

Uraon, R. S., Chauhan, A., Bharati, R., & Sahu, K. (2024b). Do agile work practices impact team performance through project commitment? evidence from the information technology industry. *International Journal of Productivity and Performance Management*, *73*(4), 1212–1234. https://doi.org/10.1108/IJPPM-03-2023-0114

van Manen, H., & van Vliet, H. (2014). Organization-wide agile expansion requires an organization-wide agile mindset. *Product-Focused Software Process Improvement, PROFES 2014*, *8892*, 48–62. https://doi.org/10.1007/978-3-319-13835-0_4

Wellington, C. A., Briggs, T., & Girard, C. D. (2005). Comparison of student experiences with plan-driven and agile methodologies. *Proceedings Frontiers in Education 35th Annual Conference*, 12–18. https://doi.org/10.1109/FIE.2005.1611951

Zhu, Y.-Q., Gardner, D. G., & Chen, H.-G. (2018). Relationships between work team climate, individual motivation, and creativity. *Journal of Management*, *44*(5), 2094–2115. https://doi.org/10.1177/0149206316638161

Appendix

List of Figures

1 Theoretical Framework 7
2 Distribution Assumption: Histograms of Variable Distribution 23
3 Homoscedasticity Assumption: Residual plots (paths) 24
4 Boxplot of ASA and AWPI: Divided by Sample 26
5 Saturated (Mediation) Model 27
6 Comparison of Multiple Models 28
7 Linearity Assumption: Scatterplot with prediction intervals 62
8 Distribution Assumption: Q-Q plots for each variable 63
9 Homoscedasticity Assumption: Residual boxplot (ASA & AWPI) 63
10 Multigroup (Mediation) Model 63
11 Subfactor (Mediation) Model 64
12 Separated (Mediation) Model 64
13 Practices (Mediation) Model 65

Figure 1

Theoretical Framework

Figure 2

Distribution Assumption: Histograms of Variable Distribution

Figure 3

Homoscedasticity Assumption: Residual plots (paths)

Figure 4

Boxplot of ASA and AWPI: Divided by Sample

Figure 5

Saturated (Mediation) Model

Figure 6

Comparison of Multiple Models

Figure 7

Linearity Assumption: Scatterplot with prediction intervals

Figure 8

Distribution Assumption: Q-Q plots for each variable

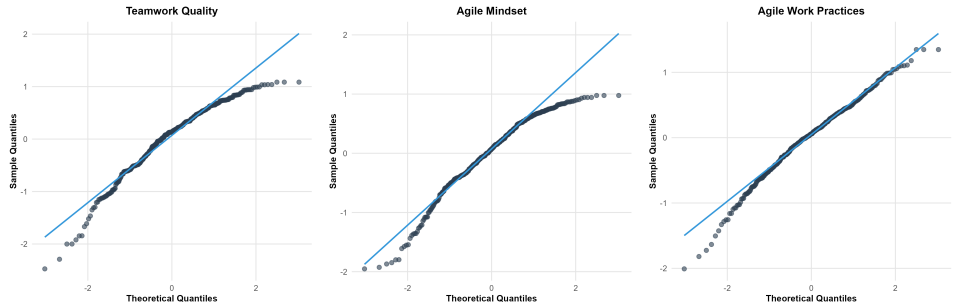


Figure 9

Homoscedasticity Assumption: Residual boxplot (ASA & AWPI)

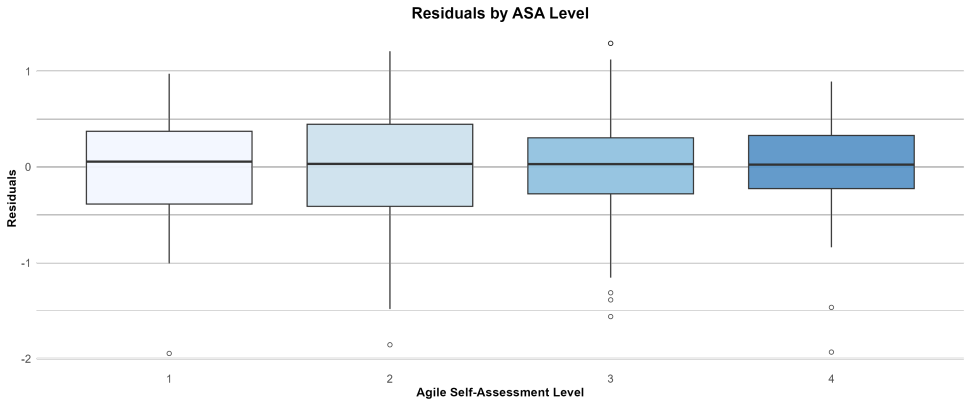


Figure 10

Multigroup (Mediation) Model

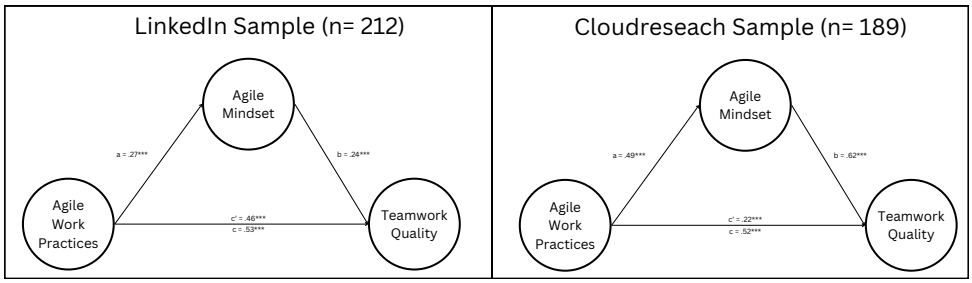


Figure 11

Subfactor (Mediation) Model

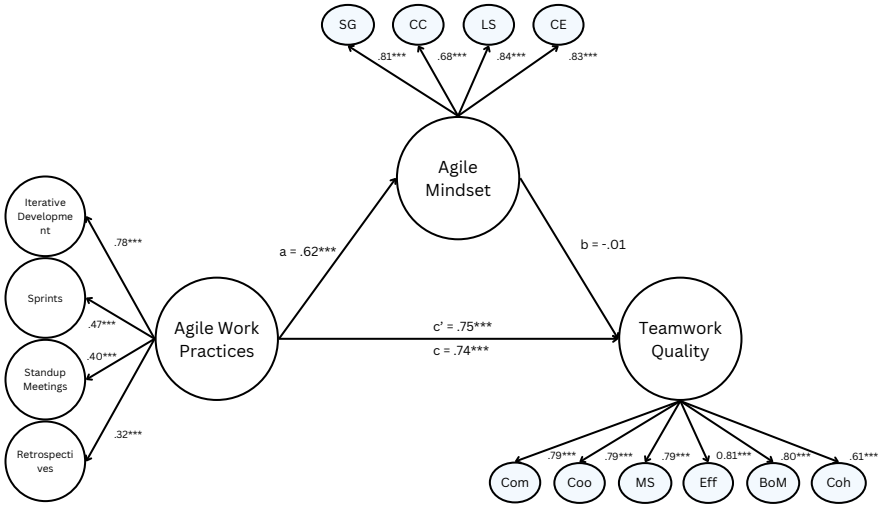


Figure 12

Separated (Mediation) Model

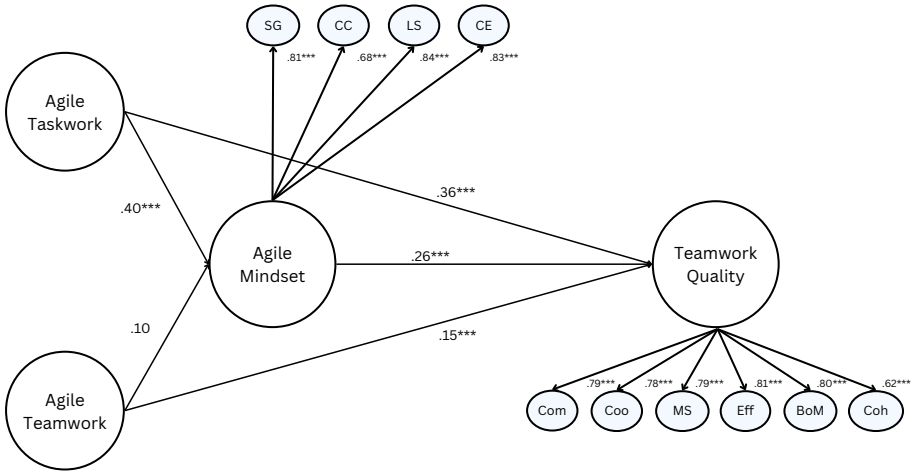
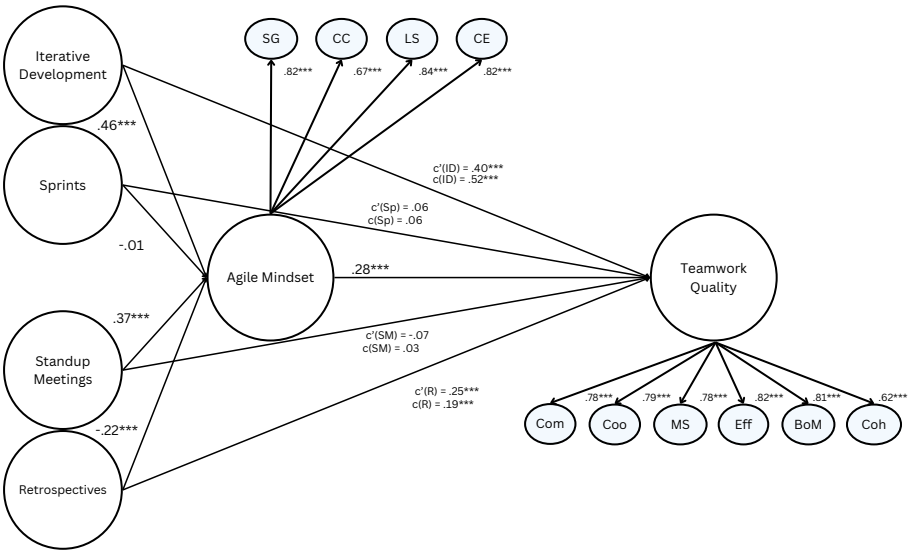


Figure 13

Practices (Mediation) Model



List of Tables

1 Sample Distribution 15
2 Descriptive Statistics and Correlations of Main Variables 20
3 Correlations Among Teamwork Quality, Agile Mindset, and Agile Work Practice Instrument Variables 22
4 Descriptive Statistics for Subsamples 67
5 Distribution of ASA Across Datasets 68
6 Distribution of Gender Across Datasets 68
7 Distribution of Department Across Datasets 69
8 Distribution of Agile Roles Across Datasets 70
9 Distribution of Agile Frameworks Across Datasets 71
10 Shapiro-Wilk test Results 71
11 Breusch-Pagan Test Results 72
12 Levene's Test Results 72
13 Variance Inflation Factors 72
14 Reliability Coefficients 73
15 ANOVA: AWPI Differences Across ASA Levels 73
16 Tukey HSD Post-Hoc Test Results 74
17 Correlation Matrix of AWPI Dimensions and ASA 74
18 Saturated (Mediation) Model Results 74
19 Multi-Group Model Results 75
20 Subfactor Model Results 76
21 Separated Analysis Results 77
22 Practices Model Results with Indicators 78
23 Model Fit Indices Comparison 78
24 R-squared and Effect Size Values 79

Table 1

Sample Distribution

Table 2

Descriptive Statistics and Correlations of Main Variables

Table 3

Correlations Among Teamwork Quality, Agile Mindset, and Agile Work Practice Instrument Variables

Table 4

Descriptive Statistics for Subsamples

Subsample	Age		Work Experience		Agile Work Experience		Team Size	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Austrian Bank	51.67	5.51	21.20	4.81	12.40	5.39	31.00	33.87
Cloudresearch	37.30	10.06	14.40	10.15	7.52	6.57	16.99	44.85
IT Service Provider	39.75	14.73	12.53	5.79	5.25	2.50	14.00	8.83
LinkedIn	39.83	9.84	15.08	9.01	7.27	4.76	12.75	14.06

Table 5

Distribution of ASA Across Datasets

Subsample	Category	Count	Percentage (%)
Austrian Bank	Mostly agile	1	33.33
	All agile	2	66.67
Cloudresearch	All plan-driven	31	16.40
	Mostly plan-driven	81	42.86
	Mostly agile	64	33.86
	All agile	13	6.88
IT Service Provider	All plan-driven	1	25.00
	Mostly plan-driven	2	50.00
	Mostly agile	1	25.00
LinkedIn	All plan-driven	4	1.95
	Mostly plan-driven	44	21.46
	Mostly agile	101	49.27
	All agile	56	27.32

Table 6

Distribution of Gender Across Datasets

Subsample	Category	Count	Percentage (%)
Austrian Bank	Female	2	66.67
	Male	1	33.33
Cloudresearch	Female	63	33.33
	Male	124	65.61
	Other	2	1.06
IT Service Provider	Female	1	25.00
	Male	3	75.00
LinkedIn	Female	37	18.05
	Male	163	79.51
	Other	5	2.44

Table 7

Distribution of Department Across Datasets

Subsample	Category	Count	Percentage (%)
Austrian Bank	Information Technology (IT)	3	100.00
Cloudresearch	Administration	8	4.23
	Customer Service	7	3.70
	Finance / Accounting	11	5.82
	Human Resources (HR)	4	2.12
	Information Technology (IT)	77	40.74
	Marketing	13	6.88
	Operations	22	11.64
	Other	16	8.47
	Purchasing / Procurement	1	0.53
	Research & Development	19	10.05
	Sales	11	5.82
IT Service Provider	Information Technology (IT)	4	100.00
LinkedIn	Administration	1	0.49
	Finance / Accounting	4	1.95
	Human Resources (HR)	1	0.49
	Information Technology (IT)	155	75.61
	Marketing	1	0.49
	Operations	5	2.44
	Other	20	9.76
	Research & Development	15	7.32
	Sales	3	1.46

Table 8

Distribution of Agile Roles Across Datasets

Subsample	Category	Count	Percentage (%)
Austrian Bank	Agile Coach	2	40.00
	Scrum Master	3	60.00
Cloudresearch	Agile Coach	7	3.63
	Agile Team member	39	20.21
	Business Analyst	24	12.44
	Other	6	3.11
	Product Owner	15	7.77
	Project Manager	54	27.98
	Release Train Engineer	2	1.04
	Requirements Engineer	3	1.55
	Scrum Master	6	3.11
	Teamlead	37	19.17
IT Service Provider	Agile Coach	1	25.00
	Agile Team member	1	25.00
	Project Manager	1	25.00
	Scrum Master	1	25.00
LinkedIn	Agile Coach	20	6.64
	Agile Team member	82	27.24
	Business Analyst	9	2.99
	Other	41	13.62
	Product Owner	24	7.97
	Project Manager	33	10.96
	Release Train Engineer	4	1.33
	Requirements Engineer	18	5.98
	Scrum Master	26	8.64
	Teamlead	44	14.62

Table 9

Distribution of Agile Frameworks Across Datasets

Subsample	Category	Count	Percentage (%)
Austrian Bank	Individual solution	1	16.67
	Kanban	1	16.67
	Other	1	16.67
	Scrum	3	50.00
Cloudresearch	Individual solution	34	14.11
	Kanban	21	8.71
	Large Scale Scrum (LESS)	13	5.39
	Lean	13	5.39
	Other	20	8.30
	Scaled Agile Framework (SAFe)	24	9.96
	Scrum	50	20.75
	Scrum / XP Hybrid	25	10.37
	Scrum of Scrums	7	2.90
	Scrumban	8	3.32
	XP	26	10.79
IT Service Provider	Kanban	2	33.33
	Scrum	3	50.00
	Scrumban	1	16.67
LinkedIn	Individual solution	44	12.29
	Kanban	82	22.91
	Large Scale Scrum (LESS)	4	1.12
	Lean	19	5.31
	Other	24	6.70
	Scaled Agile Framework (SAFe)	27	7.54
	Scrum	109	30.45
	Scrum / XP Hybrid	10	2.79
	Scrum of Scrums	15	4.19
	Scrumban	22	6.15
	XP	2	0.56

Table 10

Shapiro-Wilk test Results

Variable	Statistic	P_Value
TWQ_Total	0.95	< 0.001
AM_Total	0.95	< 0.001
AWPI_Total	0.99	< 0.001

Table 11

Breusch-Pagan Test Results

Path	BP Statistic	p-value
Path a (AWPI → AM)	32.35	< 0.001
Path c (AM, AWPI → TWQ)	27.04	< 0.001

Table 12

Levene's Test Results

Test	F-value	df	p-value
Levene's Test	2.57	3	0.054

Table 13

Variance Inflation Factors

Variable	VIF
AWPI_Total	1.17
AM_Total	1.17

Table 14

Reliability Coefficients

Scale	Cronbach's α	Composite Reliability
Teamwork Quality		
Communication	.77	.85
Coordination	.77	.87
MutualSupport	.82	.88
Effort	.84	.90
Balance	.80	.88
Cohesion	.56	.82
TWQ - Total	.93	.94
Agile Mindset		
SelfGuidance	.83	.88
CustomerCocreation	.69	.81
LearningSpirit	.78	.85
CollaborativeExchange	.79	.86
AM - Total	.92	.93
Agile Work Practices Instrument		
IterativeDev	.75	.84
Sprints	.87	.91
StandUp	.89	.92
Retrospective	.88	.92
Taskwork	.82	.87
Teamwork	.82	.87
AWPI - Total	.85	.88

Table 15

ANOVA: AWPI Differences Across ASA Levels

Sample	F-value	df	p-value	R^2
Total Sample	8.02	3	0.000	0.06
LinkedIn Sample	13.60	3	0.000	0.16
Cloudresearch Sample	2.64	3	0.051	0.04

Table 16

Tukey HSD Post-Hoc Test Results

Sample	Comparison	Difference	p-value
Total Sample	2-1	-0.28	0.030
	3-2	0.21	0.005
	4-2	0.36	< 0.001
LinkedIn Sample	3-1	0.66	0.030
	4-1	0.79	0.007
	3-2	0.44	< 0.001
	4-2	0.57	< 0.001

Table 17

Correlation Matrix of AWPI Dimensions and ASA

Variable	1	2	3	4	5	6	7	8
1. Iterative_Development	1							
2. Sprints	.37***	1						
3. StandUp	.23***	.36***	1					
4. Retrospective	.26***	.14**	.20***	1				
5. Taskwork	.80***	.85***	.36***	.23***	1			
6. Teamwork	.31***	.32***	.77***	.78***	.38***	1		
7. AWPI_Total	.68***	.68***	.65***	.59***	.82***	.80***	1	
8. ASA	.05	.26***	.24***	-.12*	.20***	.07	.15**	1

Note. * p < .05, ** p < .01, *** p < .001

Table 18

Saturated (Mediation) Model Results

Path	β	p	SE	CI	
Path a (AWPI → AM)	.38	< .001***	0.04	[0.29,	0.46]
Path b (AM → TWQ)	.26	< .001***	0.05	[0.17,	0.35]
Path c' (AWPI → TWQ)	.40	< .001***	0.05	[0.31,	0.50]
Indirect Effect (a × b)	.10	< .001***	0.02	[0.05,	0.14]
Total Effect (c' + ab)	.50	< .001***	0.04	[0.43,	0.58]

Note. *** p < .001

Table 19

Multi-Group Model Results

path	Beta	p	se	CI	
LinkedIn Sample					
AWPI → AM	.27	< .001***	0.06	[0.14,	0.35]
AM → TWQ	.24	< .001***	0.08	[0.17,	0.47]
AWPI → TWQ	.46	< .001***	0.08	[0.39,	0.70]
Indirect Effect	.06	.005**	0.03	[0.03,	0.14]
Total Effect	.53	< .001***	0.07	[0.48,	0.77]
Cloudresearch Sample					
AWPI → AM	.49	< .001***	0.09	[0.42,	0.76]
AM → TWQ	.62	< .001***	0.04	[0.48,	0.63]
AWPI → TWQ	.22	< .001***	0.06	[0.11,	0.35]
Indirect Effect	.30	< .001***	0.05	[0.22,	0.44]
Total Effect	.52	< .001***	0.06	[0.43,	0.67]
Path Differences					
△ AWPI → AM	-.22	< .001***	0.10	[-0.55,	-0.15]
△ AM → TWQ	-.38	.007**	0.09	[-0.40,	-0.06]
△ AWPI → TWQ	.24	.001**	0.10	[0.13,	0.51]
△ Indirect Effect	-.24	< .001***	0.06	[-0.37,	-0.13]
△ Total Effect	.00	.428	0.09	[-0.11,	0.26]

Note. ** p < .01, *** p < .001

Table 20

Subfactor Model Results

Path	β	p	SE	CI	
Indicators					
AM → SelfGuidance	.81	< .001***	0.03	[0.75,	0.88]
AM → CustomerCocreation	.68	< .001***	0.03	[0.61,	0.74]
AM → LearningSpirit	.84	< .001***	0.03	[0.79,	0.89]
AM → CollaborativeExchange	.83	< .001***	0.02	[0.78,	0.88]
TWQ → Communication	.79	< .001***	0.03	[0.72,	0.85]
TWQ → Coordination	.79	< .001***	0.03	[0.74,	0.84]
TWQ → MutualSupport	.79	< .001***	0.03	[0.73,	0.84]
TWQ → Effort	.81	< .001***	0.02	[0.76,	0.86]
TWQ → Balance	.80	< .001***	0.03	[0.75,	0.85]
TWQ → Cohesion	.61	< .001***	0.04	[0.53,	0.70]
AWPI → IterativeDev	.78	< .001***	0.04	[0.70,	0.86]
AWPI → Sprints	.47	< .001***	0.06	[0.35,	0.59]
AWPI → StandUp	.40	< .001***	0.06	[0.27,	0.53]
AWPI → Retrospective	.32	< .001***	0.06	[0.20,	0.43]
Path Analysis					
Path b (AM → TWQ)	-.01	.865	0.09	[-0.19,	0.16]
Path c' (AWPI → TWQ)	.75	< .001***	0.09	[0.58,	0.93]
Path a (AWPI → AM)	.62	< .001***	0.06	[0.49,	0.75]
Indirect Effect (a × b)	-.01	.866	0.06	[-0.12,	0.10]
Total Effect (c' + ab)	.74	< .001***	0.05	[0.65,	0.84]

Note. *** p < .001

Table 21

Separated Analysis Results

Path	β	p	SE	CI	
Indicators					
AM → SelfGuidance	.81	< .001***	0.03	[0.75,	0.88]
AM → CustomerCocreation	.68	< .001***	0.03	[0.61,	0.74]
AM → LearningSpirit	.84	< .001***	0.02	[0.79,	0.89]
AM → CollaborativeExchange	.83	< .001***	0.03	[0.78,	0.88]
TWQ → Communication	.79	< .001***	0.03	[0.72,	0.85]
TWQ → Coordination	.78	< .001***	0.03	[0.74,	0.83]
TWQ → MutualSupport	.79	< .001***	0.03	[0.73,	0.84]
TWQ → Effort	.81	< .001***	0.02	[0.77,	0.86]
TWQ → Balance	.80	< .001***	0.03	[0.75,	0.85]
TWQ → Cohesion	.62	< .001***	0.04	[0.54,	0.70]
Path Analysis					
Path b (AM → TWQ)	.26	< .001***	0.06	[0.14,	0.37]
Path c1' (Taskwork → TWQ)	.36	< .001***	0.06	[0.24,	0.48]
Path c2' (Teamwork → TWQ)	.15	.004**	0.05	[0.05,	0.25]
Path a1 (Taskwork → AM)	.40	< .001***	0.05	[0.30,	0.51]
Path a2 (Teamwork → AM)	.10	.084	0.06	[-0.01,	0.22]
Indirect Effect Taskwork (a1 × b)	.10	< .001***	0.03	[0.05,	0.16]
Total Effect Taskwork (c1' + a1b)	.46	< .001***	0.05	[0.36,	0.56]
Indirect Effect Teamwork (a2 × b)	.03	.113	0.02	[-0.01,	0.06]
Total Effect Teamwork (c2' + a2b)	.17	.001**	0.05	[0.07,	0.28]

Note. ** p < .01, *** p < .001

Table 22

Practices Model Results with Indicators

Path	β	p	SE	CI	
Indicators					
AM → SelfGuidance	.82	< .001***	0.03	[0.76,	0.89]
AM → CustomerCocreation	.67	< .001***	0.03	[0.61,	0.74]
AM → LearningSpirit	.84	< .001***	0.02	[0.80,	0.89]
AM → CollaborativeExchange	.82	< .001***	0.02	[0.77,	0.87]
TWQ → Communication	.78	< .001***	0.03	[0.72,	0.85]
TWQ → Coordination	.79	< .001***	0.02	[0.74,	0.84]
TWQ → MutualSupport	.78	< .001***	0.03	[0.73,	0.83]
TWQ → Effort	.82	< .001***	0.02	[0.77,	0.86]
TWQ → Balance	.81	< .001***	0.02	[0.76,	0.85]
TWQ → Cohesion	.62	< .001***	0.04	[0.54,	0.70]
Path Analysis					
Path a1 (Iterative Dev → AM)	.46	< .001***	0.05	[0.36,	0.56]
Path a2 (Sprints → AM)	-.01	.825	0.05	[-0.11,	0.09]
Path a3 (Stand-up → AM)	.37	< .001***	0.05	[0.27,	0.46]
Path a4 (Retrospective → AM)	-.22	< .001***	0.04	[-0.30,	-0.13]
Path b (AM → TWQ)	.28	< .001***	0.06	[0.15,	0.41]
Path c1 (Iterative Dev → TWQ)	.40	< .001***	0.06	[0.27,	0.52]
Path c2 (Sprints → TWQ)	.06	.234	0.05	[-0.04,	0.17]
Path c3 (Standup → TWQ)	-.07	.192	0.06	[-0.18,	0.04]
Path c4 (Retrospective → TWQ)	.25	< .001***	0.05	[0.15,	0.34]
Indirect Effect Iterative Dev (a1 × b)	.13	< .001***	0.04	[0.06,	0.20]
Indirect Effect Sprints (a2 × b)	-.00	.825	0.01	[-0.03,	0.02]
Indirect Effect Stand-up (a3 × b)	.10	< .001***	0.03	[0.05,	0.16]
Indirect Effect Retrospective (a4 × b)	-.06	< .001***	0.02	[-0.10,	-0.02]
Total Effect Iterative Development (c1' + a1b)	.52	< .001***	0.05	[0.43,	0.61]
Total Effect Sprints (c2' + a2b)	.06	.281	0.06	[-0.05,	0.17]
Total Effect Standup Meetings (c3' + a3b)	.03	.563	0.05	[-0.07,	0.13]
Total Effect Retrospectives (c4' + a4b)	.19	< .001***	0.05	[0.10,	0.28]

Note. *** p < .001

Table 23

Model Fit Indices Comparison

Model	χ^2	df	p	CFI	TLI	RMSEA	SRMR	AIC	BIC
Saturated Mediation								1,306	1,326
Subfactor-Mediation	358.15	74	< .001	.896	.872	.098	.071	10,605	10,729
Separated Mediation	210.32	50	< .001	.934	.914	.089	.045	6,898	6,998
Agile Practices Model	245.16	66	< .001	.930	.910	.082	.046	6,770	6,886

Table 24

R-squared and Effect Size Values

Model	Agile Mindset		Team Work Quality	
	R^2	f^2	R^2	f^2
Saturated Model	.14	.17	.31	.46
Subfactor Model	.38	.62	.56	1.25
Separated Model	.21	.26	.36	.55
Practices Model	.38	.62	.45	.81

List of Abbreviations

AB Austrian Bank

AM Agile Mindset

ASA Agile Self-Assessment

AWPI Agile Work Practices Instrument

CR Cloudresearch (Connect)

ID Iterative Development

IMO Input-Mediator-Output

ITSP German IT Service Provider

LI LinkedIn

Re Retrospectives

Sp Sprints

StM Standup Meetings

TWQ Teamwork Quality

Use of Artificial Intelligence Statement

Four AI tools were used to complete this thesis. The first tool, ”Perplexity”, an AI-powered search engine similar to ChatGPT, was used to provide coding assistance, feedback, and revision. Specifically, it supported the development of Latex code for the formatting of the paper and R code for data analysis. I combined knowledge from online sources, mostly Stack Overflow, and integrated them with Perplexity to improve my code snippets and work out possible mistakes. In addition, Perplexity served as a feedback and revision tool, providing constructive feedback on the structure, flow, and readability of my prewritten sections.

The second tool, ”DeepL Write”, was used to rewrite sentences, focusing on improving language correctness and offering synonyms to avoid repeating words.

Similarly, Grammarly was used to correct spelling and grammatical errors in real time. As only the free version of Grammarly was used, its functionality was limited to basic corrections without the rewriting function.

Finally, Research Rabbit was integrated with my Zotero library to improve my literature management. This combination allowed for better organisation of previously found sources and made it easier to find additional references by cross-referencing between related papers.

Abstract (English)

Agile methodologies have been widely adopted across industries due to their efficiency and adaptability. However, the anticipated benefits are not always realized. A major factor in achieving agile efficiency is fostering an agile mindset, which is frequently overlooked by organizations that focus solely on implementing agile work practices. This study aimed to quantify the role of an agile mindset in shaping the relationship between agile work practices and teamwork quality. Employing a cross-sectional design, the researchers collected data from 401 participants through an online questionnaire targeting members of project and product teams with varying project management approaches. In line with our hypothesis, the results of the structural equation model revealed a mediating role of the agile mindset in strengthening the link between agile work practices and teamwork quality, a consistent pattern across two samples. Among the practices examined, iterative development demonstrated the strongest association with both the agile mindset and teamwork quality, while retrospective frequency produced conflicting findings. In summary, this paper adds to the existing body of knowledge by empirically testing the positive relationships among agile work practices, the agile mindset, and their connection to teamwork quality. These findings provide practical insights for organizations wanting to refine their practices, cultivate a mindset change among team members, and ultimately enhance teamwork quality within their agile teams.

Keywords: Agile, Agile Mindset, Agile Work Practices, Teamwork Quality, Mediation, Cross-sectional design, SEM

Abstract (German)

Agile Methoden sind aufgrund ihrer Effizienz und Anpassungsfähigkeit in zahlreichen Branchen weit verbreitet. Dennoch werden die erwarteten Vorteile nicht immer vollständig realisiert. Ein entscheidender Faktor für die Effizienz von Agile ist die Förderung eines Agile Mindset, das von Organisationen häufig übersehen wird, die sich ausschließlich auf die Implementierung von Agile Work Practices konzentrieren. Diese Studie hatte das Ziel, die Rolle des Agile Mindset bei der Beziehung zwischen Agile Work Practices und der Teamwork Quality zu untersuchen.

Das Forschungsteam nutzte ein querschnittliches Design und sammelte Daten von 401 Teilnehmenden über einen Online-Fragebogen, der sich an Projekt- und Produktteammitglieder richtete.

Die Ergebnisse zeigten, dass das Agile Mindset eine mediierende Rolle in der Verbindung zwischen Agile Work Practices und der Teamwork Quality spielt. Dieses Muster war in zwei unterschiedlichen Stichproben konsistent. Von den untersuchten Praktiken wies Iterative Development die stärkste Verbindung mit dem Agilen Mindset und Teamwork Quality auf, während die Häufigkeit von Retrospectives widersprüchliche Ergebnisse lieferte.

Zusammenfassend trägt diese Arbeit zur bestehenden Literatur bei, indem sie die positiven Beziehungen zwischen Agile Work Practices, dem Agile Mindset und deren kombinierter Auswirkung auf die Teamwork Quality empirisch testet. Die Ergebnisse bieten praktische Einblicke für Organisationen, die ihre Agile Work Practices verbessern, ein Agile Mindset bei Teammitgliedern fördern und letztlich die Qualität der Zusammenarbeit in ihren agilen Teams steigern möchten.

Schlagwörter: Agile, Agile Mindset, Agile Work Practices, Teamwork Quality, Mediation, Cross-sectional design, SEM

Questionnaire Overview

Dear participant,

Welcome to our Teamwork Equation study! By sharing **your perspectives** on team spirit, practices and teamwork quality **in product and project teams**, you'll help us uncover insights that can transform the way we work together. You'll contribute to our understanding of effective teamwork strategies in different team settings.
Upon completion, **you'll gain access to an executive summary** that highlights the study's key findings for mastering the Teamwork Equation. Let's get started!

The survey will take **approximately 13 minutes** to answer and **consists of 4 parts**. Firstly, we are interested in the setting you work in. Secondly, we will ask you about practices and the way you think of working in a team. Thirdly, we ask for your opinion on possible measures to improve teamwork and communication, based on experienced practitioners' ideas. Lastly, we will ask you a few sociodemographic questions.

This survey is **entirely anonymous, and all data will be treated as fully confidential.** There are **no right or wrong answers**. Therefore, we would like to encourage you to answer all questions truthfully.

I hereby confirm that I have been informed about the purpose, scope, and duration of this study. I agree that the data collected is used for scientific purposes within the scope of this study. I have been informed that my personal data will be kept strictly confidential and will not be passed on to third parties.

- ○ I agree
- ○ I disagree

In this first question, we want to find out which **methodology** your product or project based **team works with**. This could range from a **fully agile approach** to a **fully plan driven (waterfall)** approach. You can find the definition for each category down below.

What methodology does your product / project team follow?

- ○ **All agile**: This refers to teams that fully embrace agile methodologies and have an iterative approach across all their projects and processes. Teams using "all agile" would likely employ practices like Scrum, Kanban, or Extreme Programming for all their work.

- ○ **Mostly agile:** This category describes teams that primarily use agile methods, but may occasionally employ some plan-driven or waterfall approaches for certain projects or phases. The majority of their work would follow agile principles, but they retain some flexibility to use other methods when deemed appropriate.

- ○ **Mostly plan-driven (waterfall):** Teams in this category primarily use traditional, sequential approaches to project management, but may incorporate some agile practices. These teams likely follow detailed upfront planning for most projects, but may use agile techniques for certain tasks or iterations.

- ○ **All plan driven (waterfall):** This refers to teams that exclusively use traditional waterfall or plan-driven methodologies. In this approach, each phase of development is completed fully before moving to the next, with comprehensive documentation and planning done upfront. These teams would likely have very structured processes, fixed requirements, and minimal changes once a project is underway.

In this section we would like you to **rate the following statements** referring to your team:

	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
There is frequent communication within our team.	○	○	○	○	○
There is intensive communication within our team.	○	○	○	○	○
Team members openly share project relevant information.	○	○	○	○	○
The team members are happy with the timeliness in which they receive information from other team members.	○	○	○	○	○
The team members are happy with the accuracy of the information received from other team members.	○	○	○	○	○
The work done on subtasks is closely harmonized.	○	○	○	○	○

Our team avoids duplication of effort.	○	○	○	○	○
Connected subtasks are well coordinated in our team.	○	○	○	○	○
Discussions and controversies are conducted constructively.	○	○	○	○	○
Suggestions and contributions of team members are respected.	○	○	○	○	○
Suggestions and contributions of team members are discussed and further developed.	○	○	○	○	○
There is a cooperative work atmosphere in our team.	○	○	○	○	○
Every team member feels fully responsible for the common team goals.	○	○	○	○	○
Every team member fully pushes the project.	○	○	○	○	○

Every team member gives the project highest priority.	○	○	○	○	○
All team members are equally engaged to achieve the common goals.	○	○	○	○	○
All team members are fully contributing to our team.	○	○	○	○	○
The team members complement one another as best they can.	○	○	○	○	○
There is personal attraction between the members of our team.	○	○	○	○	○
Our team is sticking together.	○	○	○	○	○

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I can decide for myself how I achieve a work goal.	○	○	○	○	○	○	○
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.	○	○	○	○	○	○	○
I have the courage to take on new tasks for which I do not yet know all the requirements.	○	○	○	○	○	○	○
I adjust to changes.	○	○	○	○	○	○	○
Through direct conversation, I try to find out what my customer needs.	○	○	○	○	○	○	○
I talk to my customers regularly.	○	○	○	○	○	○	○

I try to find out what is most important for the customer.	○	○	○	○	○	○	○
While working, I frequently think about how my job helps customers.	○	○	○	○	○	○	○
I try to reach my goals by satisfying customers.	○	○	○	○	○	○	○
I come up with new ideas to better complete my tasks.	○	○	○	○	○	○	○
I like exchanging views with others about the challenges of reaching our goal.	○	○	○	○	○	○	○
It is important to me to always learn something new.	○	○	○	○	○	○	○
I enjoy exploring new situations.	○	○	○	○	○	○	○
I solve difficult challenges best when I work together with others in a team.	○	○	○	○	○	○	○

I like making my work transparent for others.	○	○	○	○	○	○	○
I appreciate the different perspectives within my team.	○	○	○	○	○	○	○
I like supporting other people in my team.	○	○	○	○	○	○	○
I regularly review my approach with others.	○	○	○	○	○	○	○

You are **more than halfway through**, good job! Now we would like to know a little bit more about the **practices used in your team environment.**

To what extent does your team use one or several of the following practices?

	fully disagree	disagree	slightly disagree	indecisive	slightly agree	agree	fully agree
We develop a prototype/pilot before expanding.	○	○	○	○	○	○	○
We experiment with different ideas before settling on an approach.	○	○	○	○	○	○	○
We refine our initial ideas successively.	○	○	○	○	○	○	○
We quickly adapt our approach to changing requirements.	○	○	○	○	○	○	○
We plan our work activities in short sequences.	○	○	○	○	○	○	○
We limit the duration of our work cycles to less than 1 month.	○	○	○	○	○	○	○
We try to reduce uncertainties by keeping work cycles short.	○	○	○	○	○	○	○
We try to increase flexibility by keeping work cycles short.	○	○	○	○	○	○	○

To what extent does your team use the following practices?

	almost never	few times a year	once a month	few times a month	once a week	few times a week	daily
We have a short meeting to discuss new developments in our tasks.	○	○	○	○	○	○	○
We have a short meeting to discuss the progress of our work.	○	○	○	○	○	○	○
We have a short meeting to discuss difficulties in our tasks.	○	○	○	○	○	○	○
We have a short meeting to discuss changes in our tasks.	○	○	○	○	○	○	○
We take our time to talk about what went well in the team.	○	○	○	○	○	○	○
We take our time to discuss our work processes.	○	○	○	○	○	○	○
We take our time to critically reflect on our work activities.	○	○	○	○	○	○	○

We take our time to improve the social dynamics of the team.	○	○	○	○	○	○	○

You reached the third part! In this section, we **want to know your opinion** on measures that could be taken to **improve your work environment.**
Please **rate the following statements** and practices on their **application in your organization**:

	Not applied	Slightly applied	Moderately applied	Considerably applied	Extensively applied
Clear growth paths in the company are important to me.	○	○	○	○	○
Time for experimentation and openness for making mistakes.	○	○	○	○	○
Inter-team demos and knowledge transfer sessions.	○	○	○	○	○
Involve team members in creating ways-of-working in team and department.	○	○	○	○	○
Have team members present their work to context & peers.	○	○	○	○	○
Let team members really get to know each other on a personal level.	○	○	○	○	○
Arrange team visits to the customer and vice-versa.	○	○	○	○	○

You reached the third part! In this section, we **want to know your opinion** on measures that could be taken to **improve your work environment.**
Please **rate the following statements** and practices on their **application in your organization**:

Invite customers to share their "business context"	○	○	○	○	○

You reached the last part, we would just like to know a little bit more about your background. **Keep in mind, all information is kept anonymously** and non of the information given can be traced back to you.

Please state your age.

_____

Please state your gender.

- ○ Male
- ○ Female
- ○ Other _____

How much work-experience do you have? (in years)

	0 5 10 15 20 25 30 35 40 45 50
Total work experience in product / project teams (in years)	
Work experience with agile methodologies (in years)	

*

How many people are in your current team?

_____

What agile framework are you using?

- [ ] Scrum
- [ ] Kanban
- [ ] Scrumban
- [ ] XP
- [ ] Scrum / XP Hybrid
- [ ] Lean
- [ ] Scaled Agile Framework (SAFe)
- [ ] Scrum of Scrums
- [ ] Large Scale Scrum (LESS)
- [ ] Individual solution
- [ ] Other

What is your role within the agile team?

- [ ] Agile Team member (E.g. software development team member)
- [ ] Agile Coach
- [ ] Scrum Master
- [ ] Product Owner
- [ ] Release Train Engineer
- [ ] Project Manager
- [ ] Teamlead
- [ ] Requirements Engineer
- [ ] Business Analyst
- [ ] Other _____

Please state your job title:

_____

Which department are you currently working in?

- ○ Information Technology (IT)
- ○ Marketing
- ○ Sales
- ○ Human Ressources (HR)
- ○ Finance / Accounting
- ○ Operations
- ○ Research & Development
- ○ Customer Service
- ○ Administration
- ○ Purchasing / Procurement
- ○ Other _____

In which country are you currently working?

_____

Thank you for completing the survey, you helped us a lot! :) Please click next to finish the survey.

If you are interested in receiving the results, please leave your email below. This is not mandatory. **(Your email will only be used to inform you about the results** of the study and will not be used for advertisement)

_____