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Issues and Strategies of Agile Methodology Adoption in Remote Working Environment: A Systematic Literature Review

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Article Information	Abstract	
Submitted : 9 Jan 2024 Reviewed: 16 Jan 2024 Accepted : 9 Feb 2024 Keywords	Agile and remote work are two topics that are currently popular in the business world, especially in the information technology industry. Both have been implemented in several companies, but Covid-19 has made it more widely used. Even though remote work offers many conveniences such as saving transport time and flexibility of place, it contrasts with Agile which requires intense collaboration and communication. Some of the obstacles	

A. Introduction

In the era of globalization, space for collaboration and communication is no longer limited by place and time. As there are many choices of tools and methodologies that can be adopted, it is easier for employees to be productive in doing their jobs. Before the COVID-19 pandemic hit, remote work systems had been adopted in several multinational companies. Now, the pandemic has turned it into something familiar, thus turning the world into a global remote work area [1]. What's more, the pandemic has made remote working a key capability for some companies in pursuing resilience strategies. On the one hand, it is important for companies to understand the determinants of remote work adoption to ensure the successful implementation and use of remote work platforms. Agile has become one of the most popular methodologies in recent years. Agile helps companies to be more responsive in the dynamic and fast-paced business environment they face. By implementing agile, companies are helped to be faster, streamline decisionmaking hierarchies, increase autonomy time, flexibility, and more flexibility in finding innovative solutions in the midst of developing projects [2].

However, despite apparent advantages such as reducing commute time and being able to spend more time with the family, working from home is not an easy endeavor. It requires personal skills that allow the person to organize and carry his work without any form of direct supervision and that the job, the workplace, has a culture that supports and encourages remote work. Implementing remote work by adopting agile can be a challenge for the team. One of the demands to always be adaptive and fast in delivering products requires good teamwork [3]. The agile need for intense collaboration and communication with remote work systems contrasts with each other to support the team's success in achieving its targets. Therefore, this study has research questions in the form of: *what are the issues and constraints and strategies that can be applied in implementing remote agile?* by using a systematic literature review method.

Based on previous references (Reunamaki and Fey, 2022), research on using Agile in the midst of remote work at a financial company, found several problems. These problems include fewer opportunities for interaction and lower engagement in adopting remote agile. Remote agile also makes work full of meetings and allows leaders to have more control but doesn't provide enough support [2]. Meanwhile, some of the suggestions given for this problem are to form smaller sub-teams within the large team to facilitate communication, proactively protect non-meeting time within the organization, be truly present and build opportunities to interact with employees, as well as more micro -managing and less delegation. In another study (Cucolas, 2021), regarding the impact of Working from Home on the success of the scum project. This study used a mixed method with a qualitative survey of 138 Scrum workers using Partial Least Squares Structural Equation Modeling (PLS-SEM) following Russo & Stol's guidelines. The results obtained are that using a framework, such as Scrum, has the benefit of regulating the organization's process and, in the home working environment, it supports the employees to structure and plan their work around Scrum's events. This is important because employees could quickly lose focus and slack more while working from home without a straightforward process and defined goals. However, a controlled context hinders the competence and autonomy needs, affecting the performance of the employees. One way to cultivate a beneficial setting is to ensure that the current Scrum implementation within the projects adheres to the framework's core values (commitment, focus, openness, respect, and courage). In other words, the ideal Scrum Team is made up of autonomous, competent people who can take on challenging tasks and collaborate to reach their planned goal and attain project success. As a result of its flexibility in implementation and ability to accommodate changes, Scrum is well-suited to creating a beneficial home working environment that contributes to project success, as long as its values and pillars are followed [3].

B. Research Method

A Study Literature Review (SLR) is a methodology used in collecting references to answer a research question. The SLR methodology aims to be as unbiased as possible and able to be audited and repeated. An SLR is referred to as a secondary study and the studies that it analyses are called primary studies [7]. Essentially, a Systematic Review is a research method that summarizes the results of primary research to present a more comprehensive and balanced overview of the facts. The key characteristics of a Systematic Review are:

- It has a clear title and purpose
- It focuses on a well-defined research question
- It has a comprehensive strategy for identifying all relevant studies
- It conducts a critical evaluation of the research
- It has a clear analysis of the results of qualifying studies
- It has a structured report

1. Planning the Review

Plan for this review by identifying research questions that aligned with our research objectives. Author also determined the search strategy, search string, and inclusion/exclusion criteria. These details are discussed in more detail below.

1.1. Review objectives and research questions

This research process began with the selection of previous research related to the use of agile methodology in a remote work environment. The references searched included literature reviews and case studies, such as the study by Santhe (2022) which examined the factors that influenced the productivity of agile teams during the COVID-19 pandemic and the study by Deshpande (2017) which discussed the challenges and recommendations for implementing Scrum in Global Software Engineering (GSE). This selection of references helped the authors to narrow down their research questions.

Table 1. Search Sources		
	Emerald	
	IEEE Explore	
Electronic database	ScienceDirect	
	Sage Journals	
	Scopus	
Search items Journal and conference papers		
Search applied on	Full text	

Electronic database	Emerald IEEE Explore ScienceDirect Sage Journals Scopus
Language	English
Publication period	2017 - 2022

To fulfil these objectives, we formulated the following research questions:

- RQ1: What factors influence during remote agile implementation?
- RQ2: What are the challenges or obstacles and its strategies during remote agile implementation?

1.2. Search Strategy

In this study, the researchers used a previous study by Kitchenham and Charters (2007) as a guide for the research. They began by identifying the research goals and questions and then developed a plan to search for relevant materials, including electronic databases and printed proceedings, using inclusion and exclusion criteria in two rounds. In order to ensure they did not miss any important studies, they also used a technique called snowballing, which involved consulting the related publications of authors whose papers were identified in the DBLP database.

1.3. Search Criteria

The search criteria used for this review consist of two parts—C1 and C2, defined as follows:

- C1 is a string made up of keywords related to agile software development methods such as agility, agile, and Scrum.
- C2 is a string made up of keywords related to issues and strategy such as "issues", "strategy, "obstacle, and "opportunities".
- C3 is a string made up of keywords related to remote working such as "remote", "hybrid, "wfo", and "wfh".

Eq. (1). Boolean expression search criteria *C1 AND* C2 *AND* C3.....(1)

An example of a search done in the electronic databases is shown below: Software AND (agile OR agility OR scrum) AND ("issues" OR "challenge") AND ("strategies" OR "opportunities") AND ("remote" OR "hybrid" OR "wfh" OR "wfo" OR "pandemic")

1.4. Inclusion and exclusion criteria

The author included studies that met the following criteria:

- I1. The study was a peer-reviewed publication,
- I2. The study was in English,
- I3. The study was relevant to the search terms defined in Section 1.3,
- I4. The study was an empirical research paper, proceeding, or conference paper,

I5. The study was published between 2017-2022.

The author excluded studies:

E1. The study that did not focus explicitly on agile methods,

- E2. The study did not discuss agile in remote work,
- E3. The study did not meet the inclusion criteria.

E4. The study not an opinion, viewpoint, keynote, discussions, editorials, comments, tutorials, prefaces, and anecdote papers and presentations in slide formats without any associated papers.

2. Conducting the Review

2.1 Study search and Selection

To find studies for their research, the researchers used the search strategy described in Section 1.2 and searched the selected electronic databases. In this initial search, they retrieved 897 studies, as shown in Table 2. They only included peer-reviewed papers (I1) and excluded discussions, editorials, comments, tutorials, prefaces, and presentations (I4). The author then reviewed the titles and abstracts of the retrieved studies and applied the inclusion criteria (I2, I3, and I5) to select 429 candidate studies. In the second round, a second researcher reviewed the pre-selected studies and applied the exclusion criteria (E1, E2, E3, and E4). After these two rounds, the researchers had a final selection of 17 studies.

2.2 Data extraction and synthesis

According to guidelines, the author developed a process for extracting relevant information from the 10 primary studies included in their research. They created a form to record ideas, concepts, contributions, and findings from each study, and extracted the following data; review date, title, authors, reference, database, relevance to the theme of agile in remote work (including issues, challenges, practices, models, methods, and techniques), methodology (such as interviews, case studies, reports, surveys), data analysis, validation techniques, future work, limitations, location of the analysis, year of publication. This process ensured that the researchers could interpret the information from the studies in a structured and systematic way.

		5	search			
	Retrieved	Round 1		Round 2	Round 2	
Database		Exclude	Include	Exclude	Include	
Emerald	258	61	197	195	2	
IEEE Explore	26	3	23	21	6	
ScienceDirect	408	288	120	118	5	
Sage Journals	151	102	49	47	3	
Scopus	54	14	40	39	1	
Total	897	468	429	420	17	

Table 2. Number of identified studies during the distinct rounds of our systematic

After extracting the data from the studies, the author used content analysis to identify the focus of each study and assess the results of their data extraction using an inter-rater agreement among the researchers. For clarity, it is important to note that the Kappa coefficient, a measure of agreement, can be interpreted as follows:

- Values < 0 indicate no agreement.
- Values in the range of 0-0.20 indicate slight agreement.
- Values in the range of 0.21-0.40 indicate fair agreement.
- Values in the range of 0.41-0.60 indicate moderate agreement.
- Values in the range of 0.61-0.80 indicate substantial agreement.
- Values in the range of 0.81-1 indicate nearly perfect agreement.

The Kappa coefficient, a statistical measure of agreement, was used to calculate the inter-rater agreement, which was found to be 0.67, indicating substantial agreement. The researchers also conducted independent quality assessments for 17 of the studies and resolved any disagreements through discussion.

C. Result and Discussion

In this section, the author describes the findings of the review considering our research questions.

1. Overview of studies

The data in Table 3 shows that the number of studies on agile software development is evenly distributed across different publication sources. None of the sources has a significantly higher number of published papers on this topic from 2021 to 2022. These papers covered a range of topics related to our research.

	development				
Authors	Title	Publisher	Year		
Ronnie E. de Souza Santos, Paul Ralph [14]	A Grounded Theory of Coordination in Remote-First and Hybrid Software Teams	IEEE/ACM 44th International Conference on Software Engineering (ICSE)	2022		
Markus Schmidtner, Claudia Doering, Holger Timinger [15]	Agile Working During COVID-19 Pandemic	IEEE Engineering Management Review, Vol. 49, No. 2, Second Quarter	2021		
Chaitanya Arun Sathe, Chetan Panse [8]	Analyzing the impact of agile mindset adoption on software development teams productivity during COVID-19	Journal of Advances in Management Research © Emerald Publishing Limited	2022		
Paola Bellis, Daniel Trabucchi, Tommaso Buganza [16]	How do human relationships change in the digital environment after COVID-19 pandemic? The road towards agility	European Journal of Innovation Management Vol. 25 No. 6, 2022 pp. 821-849 Emerald Publishing Limited	2022		
P. Arunprasad, C Dey, F Jebli, A Manimuthu, Z El Hathat [17]	Exploring the remote work challenges in the era of COVID-19 pandemic: review and application model	Benchmarking: An International Journal Vol. 29 No. 10, 2022 pp. 3333-3355 © Emerald	2021		

Table 3. Summary of selected literature on remote agile software
development

Authors	Title	Publisher	Year
		Publishing Limited	
Riku Reunamäki, Carl F. Fey [10]	Remote agile: Problems, solutions, and pitfalls to avoid	Kalley School of Business, Indiana University. Published by Elsevier Inc. All rights reserved.	2022
Zahoor,Nadia., Golgeci,Ismail., Haapanen, Lauri., Ali, Imran., Arslan, Ahmad [9]	The role of dynamic capabilities and strategic agility of B2B high- tech small and medium-sized enterprises during COVID-19 pandemic: Exploratory case studies from Finland	Published by Elsevier Inc. All rights reserved.	2022
Jean Michel Sahut, Raphael Lissillour [18]	The adoption of remote work platforms after the Covid-19 lockdown: New approach, new evidence	Published by Elsevier Inc. All rights reserved.	2022
Tom L Junker, Arnold B Bakker, Marjan J Gorgievski, and Daantje Derks [19]	Agile work practices and employee proactivity: A multilevel study	Sage Journals	2022
Ash Watson, Deborah Lupton [20]	Remote Fieldwork in Homes During the COVID-19 Pandemic: Video-Call Ethnography and Map Drawing Methods	Sage Journals	2022

1.2. (RQ1) What factors influence during remote agile implementation?

RQ1 addresses the factors that are affected by remote work in agile software development. The following are the findings of the authors from the 10 collected articles shows in Table 4.

1. Coordination or collaboration

Coordination is crucial in software development because it helps groups of developers work together effectively. When groups of developers are working on interdependent tasks, they need coordination mechanisms in place to avoid duplication of work, conflicts, delays, and other inefficiencies. These coordination mechanisms can be formal or informal and are necessary to ensure that team members are able to complete their tasks without hindering one another. This practice can be caused by and effected to communication bricolage, dissatisfaction, distrust, and misunderstandings [14].

2. Responding to Change

The Agile Manifesto describes Agile software development teams as collaborative, self-organizing, cross-functional groups that are responsive to change and focused on achieving business goals. However, some Agile practitioners argue that the productivity and effectiveness of these teams depends more on their mindset and behaviour than on the specific processes and techniques outlined in the Agile manifesto. The Agile mindset refers to the attitude and way of thinking that Agile teams adopt, which is believed to have a significant impact on their performance and productivity [15].

3. Leadership

In a remote work environment, it can be challenging for leaders to align the goals of individuals with those of the organization. This is because people are dispersed and interactions are primarily virtual, which makes it harder to maintain a cohesive focus on shared objectives. As a result, leaders must not only ensure that their team members are motivated and well-being, but also work to maintain alignment with organizational goals [16].

4. Facilitating Condition

Another aspect that can impact the success of remote work is the availability of the necessary technical resources and access to organizational infrastructure. Previous research has also emphasized the importance of the home environment as a suitable place to work in terms of impacting satisfaction with remote work, perceptions of its advantages, career opportunities, and productivity [17].

One of example is it can be assumed that necessary security measures such as VPN connections were not in place for employees working from home because project management software and cloud storage typically contain sensitive information [15].

5. Policies and Guidelines

Policies and Guidelines can help improve outcomes such as job performance and team collaboration and innovation. These practices include a participatory approach among employees, an efficient recruitment process, sustainable training programs, a fair compensation policy, a diversity management policy, and efficient performance

No	Factor	Description	References
1	Coordination and Collaboration	Coordination and collaboration are necessary in software development to help groups work effectively and avoid inefficiencies such as duplication of work, conflicts, and delays.	[14], [8], [16], [17], [10], [19], [21], [22], [23], [24], [27]
2	Responding to Change	Agile software development teams are characterized by their ability to respond to change. Their productivity and effectiveness depend on their mindset and behaviour rather than specific processes and techniques.	[8], [15], [16], [10], [9], [19], [26], [27]
3	Leadership	Leaders must ensure alignment between individual and organizational goals while also taking care of team members' motivation and well-being.	[16], [7], [17], [10], [22], [23]
4	Facilitating Condition	Technical resources and access to organizational infrastructure are important for successful remote work. The home environment can also impact satisfaction, perceptions of advantages, career opportunities, and productivity.	[7], [17], [20], [21], [26]
5	Policies and guideline	Clear policies and guideline such as procedure in participatory approach, efficient recruitment, sustainable training, fair compensation, diversity management, and performance management, can improve job performance, team collaboration, and innovation.	[17], [21], [23], [24], [25]

Table 4. Summary of practices that are affected by remote work in agilesoftware development.

1.2. (RQ2) What are the challenges or obstacles and its strategies during remote agile implementation?

This section addresses research question 2, which focuses on challenges and strategies or recommendations for agile software development in remote work. The findings suggest that common challenges include communication and collaboration difficulties, work-life balance issues, and maintaining motivation and productivity. Previous articles have provided strategies such as the use of communication tools, clear policies and guidelines, structured work schedules, and employee support and resources to address these challenges. The research emphasizes the importance of effective management and support in successful remote work arrangements. Details shown in Table 5.

No	Factor	Challenge or Issues	Strategy
1	Coordination	Miscommunication, misunderstanding, and distrust.	 Increase in the number of communication channels that the teams were using to discuss information about the project Keeping minutes for official agile ceremonies (e.g., planning meeting, product backlog meeting) to make information accessible to everyone. Adapt with digital collaboration tools. Keep transparencies and express empathy Defend your team's interests in disputes Help employees set reasonable workloads
2	Responding to Change	Vulnerable to unpredictable schedules, some team members might not participate at all, perhaps in part due to not being able to multitask, team spirit can be affected.	 Recognize the need for focused time to complete work efficiently. Carefully consider who should attend meetings, and ensure that only necessary team members are included. Emphasize to all employees that their primary responsibility is to actively participate in their own team's meetings and prioritize the needs of their own team.
3	Leadership	More micro-managing and less delegation	 Excessive communication may result in giving too much advice, leading to employees relying on others to do their work Expressing empathy towards team members may inadvertently lead to doing their work for them Instead of setting goals and directing the team, it is more effective to foster shared leadership and encourage independent work by supporting and coaching employees.
4	Facilitating Condition	Environmental distraction, noise, unable to access office infrastructure	 Evaluate which tools are most effective for different teams and their specific needs. Provide thorough training and ongoing

Table 5. Findings of challenges and its strategies during remote agile
implementation.

No	Factor	Challenge or Issues	Strategy
			support to ensure that all employees are proficient in using the chosen tools.
			• Provide facilities that make it possible to support remote work employees.

D. Conclusion

Agile teams may face a number of challenges when working remotely, including miscommunication, misunderstanding, and distrust. They may also be vulnerable to unpredictable schedules, which can impact productivity and morale. Some team members may not fully participate in meetings, potentially due to their inability to multitask or other factors, which can negatively affect team spirit. Over-involvement in task-specific details and reduced delegation may lead to micro-management, which can be demotivating for team members. Environmental distractions, such as noise, and the inability to access office infrastructure may also present challenges. In addition, employees may not be familiar with remote work procedures, which can further complicate collaboration and communication.

The five major factors that have an impact on remote agile software development and their strategies, according to this research, are:

- 1. Coordination: Ensuring that team members are able to effectively communicate and collaborate with one another, despite being physically separated.
- 2. Responding to Change: Being able to quickly adapt to new developments or shifts in project requirements, even when working remotely.
- 3. Leadership: Having strong leadership that can effectively guide and motivate the team, even in a virtual setting.
- 4. Facilitating Conditions: Providing the necessary resources, tools, and support to enable team members to work effectively from a distance.
- 5. Policies and Guidelines: Establishing clear policies and guidelines for remote work, including expectations for communication, collaboration, and productivity.

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