Evaluating The Adoption Of Scaled Agile Methodologies In Saudi Arabia

Ahmed Osama Mansour[1*], M. Rizwan Jameel Qureshi[2]

King Abdul-Aziz University, Jeddah, Saudi Arabia.

Abstract

A survey of agile practitioners in Saudi Arabia was conducted to find out how agile software development methods are used. Quantitative data was collected using convenience sampling, and then descriptive statistics were used to look at the data. In this paper, we will discuss a subset of the survey data that focuses on the adoption of scaled agile methods and how they are being used. The subsample of 26 answers was looked at to get some first insights about how these methods are used in Saudi Arabia. The results show that using scaled agile methods is both significant and generally in line with what is happening around the world. The study also describes how scaled Agile methods are customized to business requirements and how practitioners view their advantages for project success.

Keywords: large-scale agile, agile software development, agile practices, agile adoption, survey

I. INTRODUCTION

Businesses nowadays need the ability to rapidly adapt their processes for developing and providing value to their consumers if they want to survive in the marketplace. Software-based systems are crucial to this capability. The methods used to create them must promote teamwork, creativity, and rapid progress. Agile approaches have developed as a result of the traditional waterfall methods' inability to meet the new challenge. Although agile methodologies were first intended to be used in small, one-team projects[7], their advantages have made them desirable for use in larger projects and in larger businesses [14]. As a result of this, scaled agile methods were developed, and they are now widely used [12], [15].

Despite the widespread adoption of agile software development methods (ASDMs), particularly scaled agile methods, there isn't much research on the topic. As of Saudi Arabia, there are few statistics on

[1]*Department of Information Technology, King Abdul-Aziz University, Jeddah, Saudi Arabia, aahmedmansour@stu.kau.edu.sa

[2]Department of Information Technology, King Abdul-Aziz University, Jeddah, Saudi Arabia, rmuhammd@kau.edu.sa

the adoption of ASDM in its current condition and none on the adoption of scaled agile methods. In order to close that gap, we chose to plan and carry out a survey among Saudi Arabia's agile practitioners. While the survey's primary focus was on the use of ASDM in Saudi Arabia, this study will narrow in on the use of scaled agile methods. As a result, we exclusively analyze the data relevant to these methodologies. The remainder of the paper is structured as follows: The second section after the introduction discusses scaled agile methods and the extent of global adoption. Section III then goes on to detail our research approach. The survey findings are then shown and discussed in Section IV. Lastly, conclusions are made, along with certain research limitations.

II. LITRATRE REVEW

A. Scaled Agile Methods

2022 marks the 21st year since the Agile Manifesto was first published [4]. Even after twenty one years, ASDMs are still becoming more and more popular. Because of the benefits they bring to software development, larger projects and businesses are interested in them [14], even though it can be hard to set them up in larger projects [17]. In comparison to small projects, larger projects are characterized by the requirement for an additional coordination component, which could make the implementation of the agile method more complex[6], [17]. Furthermore, managing team collaboration across teams as well as interacting with other organizational divisions such as human resources, marketing and sales, and product management introduces new concerns to large-scale agile [34]. Furthermore, scaling up could make the development staff less accessible to end users and other important stakeholders [14].To address these problems, many scaled agile methodologies and frameworks have been developed. Among these are SAFe, Enterprise Scrum, Scrum@Scale, Nexus, Spotify, and the Discipline Agile Delivery (DAD) framework. Scaled Agile methods are widely employed in practice [12],[15] and studied in the literature [2],[19[,]20].

We chose a total of seven scaled agile frameworks for our research, and the following sections provide descriptions of each. In III section, the selection process is described in detail. Horlach et al. [19] divide these frameworks into two groups: those that focus on the enterprise (like Disciplined Agile Delivery and Scaled Agile Framework) and those that focus on the relationships between teams (like Scrum of Scrums, Enterprise Scrum, Large-scale Scrum, Nexus, and the Spotify Model).

B. Scrum of Scrums

The first time Scrum of Scrums was used was in 2001, when Jeff Sutherland announced it [32]. It can be used with large groups of individuals who are split up into agile teams of 5–10 people. The Daily Scrum is held by each sub-team, and one person is chosen to serve as an "ambassador" and attend the daily meeting with the ambassadors from other teams. In summary, this configuration is known as the "Scrum of Scrums"[1]. The ambassadors deliver the completion, future steps, and obstacles on behalf of the teams they represent at the Scrum of Scrums meeting. Additionally, they work to establish responsibility boundaries and a formalization of technical interfaces.

C. Enterprise Scrum

Mike Beedle created Enterprise Scrum and initially introduced it in 2003. Ever since, it has undergone practical testing and development. According to the most up-to-date Enterprise Scrum Definition 4.0 [5], Enterprise Scrum is a management framework that aims to rapidly deliver the most business value and balanced benefits to all parties involved through autonomous, self-DMOS teams using an iterative-incremental, all-at-once approach. The acronym "self-DMOS" stands for "self-directed, self-managed, self-organizing, and self-selected."

D. Enterprise Scrum

The Disciplined Agile Delivery (DAD) paradigm is a combination of several other methods, such as Scrum, Kanban, Agile Modeling, SAFe, Extreme Programming, Agile Data, and Unified Process. DAD fills the gaps left by conventional agile methodologies while allowing flexibility to apply different approaches [3]. The key features of this paradigm include: a people-first, learning-focused hybrid agile/lean approach; a risk-value delivery lifecycle; goal-drivenness; enterprise awareness; tactical team-level scalability; and strategic company-wide scalability [26].

E. Scaled Agile Framework

Scaled Agile Framework (SAFe) is a free knowledge base of tested, integrated paradigms for Lean-Agile development at an enterprise scale [28]. Dean Leffingwell developed SAFe in 2012, and it has continued to develop to the present 5.0 version. The SAFe website [29] includes a graphic summary of the Framework along with advice on how to scale agile development at the portfolio, value stream, program, and team levels. The framework's scalability and modularity enable every firm to customize it for their particular business model. The success of SAFe may be attributed to the emphasis placed on four principles: alignment, built-in quality, transparency, and program execution. The SAFe framework is based on nine core principles that

were developed using insights from agile methodologies, Lean product development, systems thinking, and the experiences of leading businesses. The program level is at the core of SAFe, with its emphasis on an organization known as the Agile Release Train (ART). Each ART uses a shared program backlog to focus teams on the same goals and deliver measurable system-level solutions every two weeks. Agile teams in an ART can choose between Scrum, Kanban, or XP as their preferred framework. Additionally, they apply built-in quality practices. In order to deliver the products, services, and solutions necessary to execute the business plan, each SAFe portfolio contains the value streams, people, and processes necessary to enable Lean-Agile funding and governance [28].

F. Large-scale Scrum

The Large-scale Scrum (LeSS) framework was developed by Bas Vodde and Craig Larman in 2013 as a result of their experience with large-scale product development. Both authors [25] agree that mastering and adopting basic one-team Scrum is a necessary first step toward scaling Scrum. Large-scale Scrum necessitates assessing the objective of single-team Scrum parts and determining how to achieve the same goal while remaining within the constraints of standard Scrum guidelines. LeSS offers two large-scale Scrum frameworks [33], the basic LeSS, which is applicable to up to eight teams (each with eight individuals), and the LeSS Huge, which incorporates extra scaling aspects, allowing development for up to hundreds of engineers.

G. Nexus

Ken Schwaber and Scrum.org developed the Nexus framework in 2015. The framework's ultimate goal is for several Scrum Teams (often between three and nine members) to collaborate on a single Product Backlog to produce an Integrated Increment [30]. Unlike the traditional Scrum methodology, Nexus includes a new role—the Nexus Integration Team—which is comprised of Nexus Integration Team members in addition to the Scrum Master and Product Owner. Together, they make sure that Nexus is used while keeping the Scrum methodology in mind. The events that occur within the Nexus framework and those that occur within the Scrum methodology are nearly identical. As a new artifact, the Nexus Sprint Backlog supports the scrum teams' transparency. Additionally, each team maintains its own backlog of tasks.

H. Spotify Model

Spotify was founded in 2008 in Stockholm, Sweden, making it a new firm in the streaming music industry. Over the course of three years, Spotify went from 30 to 250 employees. They created a scaling

paradigm with squads, tribes, chapters, and guilds to be able to accommodate this increase. Other businesses might employ this technique, which is called the Spotify Model. The smallest work group at Spotify is called a "Squad," which functions similarly to a Scrum team [21]. A Squad is a small, cross-functional, self-organizing team that sits together, has end-to-end responsibility for the projects they are producing, and often has less than eight members. Each squad is autonomous and has its own long-term purpose. This implies that each squad determines what to construct, how to accomplish that, and how to collaborate. Squads that work in similar fields are divided into tribes. There is a Tribe Lead for each tribe who is in charge of creating the finest habitat for the squads that make up that tribe. A Chapter is a brand-new kind of organizational structure that organizes individuals according to their capabilities, such as their skills, experience, and knowledge. Each chapter holds frequent meetings to talk about its particular difficulties and areas of competence. A Guild is a more organic and extensive "group of interest," or a collection of individuals who desire to share information, resources, code, and best practices. Chapters are always specific to a tribe, but a guild typically spans the entire company [21].

I. State of Scaled Agile Method Adoption

Since 2006, VersionOne (later CollabNet VersionOne) has been conducting an annual "State of Agile" survey with a global reach in the business world. The 2013 edition of this prominent practitioner survey included a new subsection dedicated to Scaled Agile Methods. The most recent (15th) edition [13] took place from August to December 2021. Many scientists have expressed interest in the adoption of agile software development techniques (ASDMs) [11], [14], [22], and [24]. The following is the motivation for our study: Although there is a wealth of information on the global adoption of scaled agile methods, information on their use in Saudi Arabia is relatively rare [8], [9].

III. RESEARCH METHOD

This section describes the survey's planning and execution. In this study, we examine the subset of the survey that is concerned with scaled agile methods' utilization in Saudi Arabia. Corresponding details of the survey layout are provided in Sub-section A. The method of data gathering is then detailed in Sub-section B.

A. Survey Design

The survey's primary objective was to assess Saudi Arabia's adoption of agile software delivery methods. This target was broken down into various subgoals and related research questions. We focused

exclusively on a group of research questions pertaining to scaled agile methods. Our goal is to uncover:
RQ1: How widely used is the Scaled Agile Method in Saudi Arabia?
RQ2: How much are scaled agile methods adapted to business requirements?
RQ3: How are the advantages of adopting scaled agile methods perceived?
RQ4: What other agile practices are used in conjunction with scaled agile frameworks?
The survey instrument had 18 questions, which were logically grouped into three categories:

- General demographic information about respondents, and the team's primary ASDM.
- Adopted agile practices.
- Demographics questions.

To identify a primary ASDM that the team utilizes, a selection of ASDMs obtained from the State of Agile survey [12] was presented to the respondents.

B .Data Collection

The Qualtrics survey tool was used to implement the survey, which was made online accessible. We employed a convenience sampling technique [18] in which social media played a significant role. We distributed the survey link to 17 professional LinkedIn and Facebook groups with almost 20,000 members, the majority of whom were working in Saudi Arabia. Following that, we sent the link to our industry connections (about 50) via email or LinkedIn message. Then, 1401 users were targeted in an advertising campaign that was run through the LinkedIn network. We received 324 answers in total. 101 of them weren't completed, 32 were removed by the participants, and 191 were finished and valid. We later eliminated 22 responses from the set of 191 completed responses during the analysis since the respondents said they had not been working with any agile teams at the time the data was collected. As a result, 169 relevant responses were further examined using the basic descriptive statistics techniques.

IV.RESULTS ANALYSIS

This section describes the background and demographics of the respondents. Then, it provides a full analysis of the survey's findings about the adoption, customization, and benefits of scaled agile methodologies among Saudi Arabian companies.

A. Participants Demographics

Considering the industry sector, the majority of respondents were from the fields of information technology/software development (40%) and finance (10%), respectively. Less frequently occurring domains ranged from 4% to 7% each. Then, we looked at the respondents' job positions and years of experience. The majority of respondents (43%) acted as members of the development team, while Product Owners (14%) and Agile coaches/Scrum Masters (18%). We discovered that those in managerial IT roles, product owners, and scrum masters had more experience (often more than 3 years) using agile methods than those on development teams (mostly less than 3 years). The number of respondents having 1–2 years' experience with ASDMs (26%), 3–4 years' experience (31%), and greater than 5 years' experience (26%).

B. Adoption of Scaled Agile Methods

Figure 1 shows the adoption of the methodologies examined in the survey. Some methodologies were aggregated in order to improve the clarity of the graph. As a result, a group called Scaled Agile contains the following methods: Enterprise Scrum, Large Scale Scrum, Nexus, Scaled Agile Framework, Scrum of Scrums, Spotify Model, and DAD (Disciplined Agile Delivery) are some more agile methodologies. Following that, the Other group and the Lean, DSDM, and XP groups were combined into a new group called Other. Figure 1 shows that the most commonly used agile method is Scrum, which was mentioned by 44% of respondents. In total, Scrum and its agile extensions (Scrumban, Scrum/XP hybrid) account for 69% of the agile market. Overall, scaled agile methods are reportedly used by 16% of respondents.

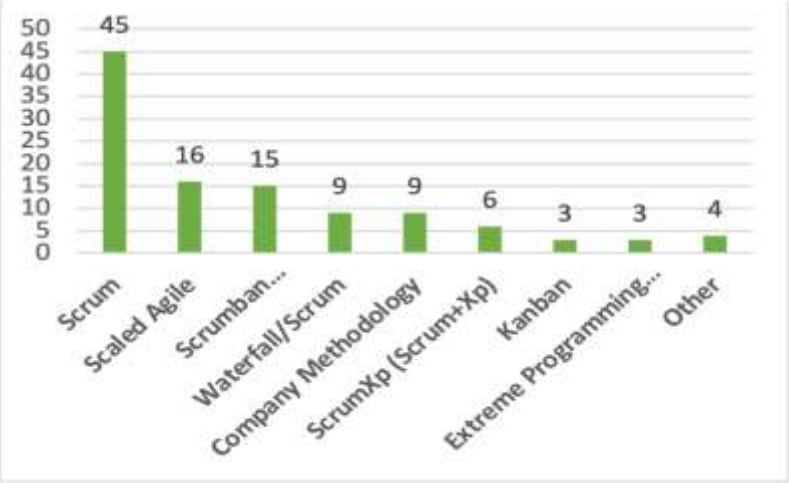

Fig. 1. Agile methods adoption

Figure 2 illustrates the percentage of Scaled Agile Methods usage. SAFe (46%) and Less (14%) are the two most popular methods, followed by Scrum of Scrums with (14%). The Spotify Model and Enterprise Scrum each account for (11%) of the market. " leadership position is consistent with the findings of the CollabNet VersionOne study [12]. However, our findings show that even more people are using SAFe (46% versus 30% globally). Similar higher adoption is true for the Spotify Model (11.5% versus 5% globally) and Enterprise Scrum (11.5% versus 3.5% globally).

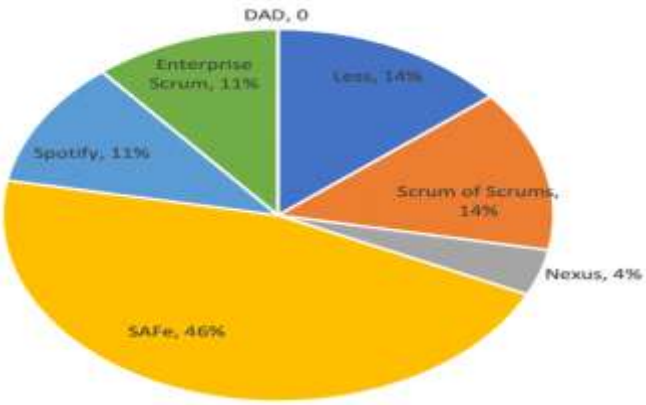

Fig.2. Percentage of Scaled Agile methods adoption (n=26)

Figure 3 displays the use of ASDMs in companies of various sizes. All company size groups continue to show that Scrum hybrids are at the forefront of these practices. Unsurprisingly, larger businesses tend to employ scaled agile methods more frequently. They are employed to a lesser extent in small and medium-sized businesses as well.

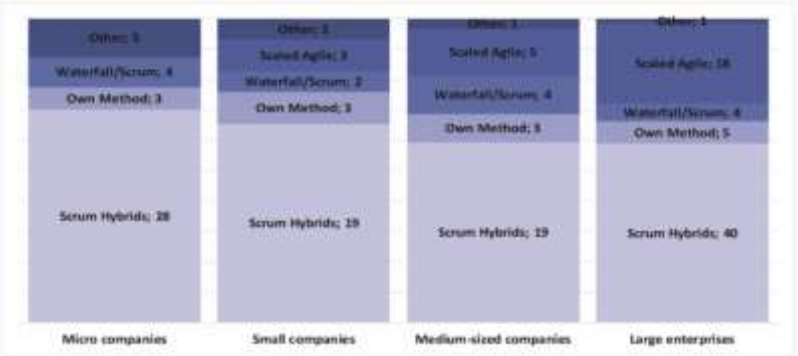

Fig.3. Agile methods adoption by company size

C. Scaled Agile Methods adaptation

Implementing software development methodologies "by the book" is uncommon [16]. Contrarily, method tailoring is achieved by choosing,

modifying, and combining specific software methods. We sought to determine the degree to which scaled Agile methods were adapted to business requirements (RQ2). We limited the sample to only those responses (n = 26) where only one of the scaled agile methodologies was chosen as the primary adopted method. Figure 4 shows the replies for each scaled agile method individually and collectively in the last row.

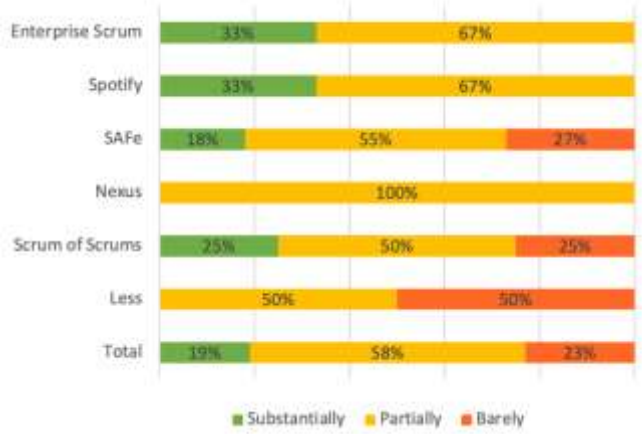

Fig.4. Replies to what extent each scaled agile method is tailored to company needs

Scaled agile Methods were generally partially (58%) or substantially (19%) customized to the demands of the company. (23%) of the respondents chose the option that was barely customized. In addition, most scaled agile methods are modified either partially or substantially to meet the specific needs of the company. None of the respondents chose the not at all option. These findings support the fundamental principles that underlie agile approaches, namely that agile methodologies and frameworks are merely tools for kicking off the agile transformation. In fact, the core of agile thinking is the principle that each business's process must be tailored to individual company needs [10]. These results also show that not all necessary practices are covered by current scaled agile methods. This is particularly true with Scrum or Kanban, which are project management-focused methodologies that do not include the necessary software engineering practices. This also applies to scaled agile methodologies, which heavily rely on Scrum.

D. Perceived advantages of adopting scaled agile methods

This section contains the analysis that responds to research question RQ3. The sample was limited to those replies (n = 26) that claimed to use scaled agile methods. Participants were asked to rate how

beneficial they believed this technique would be to their team's chances of completing the project successfully. The Standish Group criteria [31] were used to determine whether or not a project was successful ,if the program was completed on schedule, under budget, and to everyone's satisfaction. The findings for each scaled agile method are displayed in Figure 5. Aggregated proportions are presented in the final row.

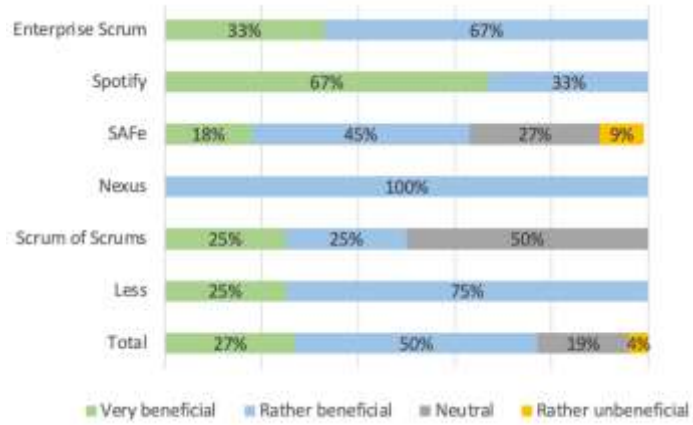

Fig.5. Perceived advantages of adopting scaled agile methods

Overall, scaled agile methods were rated as being rather beneficial by 50% of respondents and very beneficial by one third. These findings show that Scaled Agile Methods should be used as a driver for Saudi Arabia's practitioners' digital transformation initiatives. None of the scaled agile methods were considered to be very unbeneficial; SAFe was only considered to be somewhat unbeneficial in one instance. The findings indicate a high level of satisfaction and perceived benefits, particularly for the Spotify Model.

E. Agile Practices Adoption

The survey's emphasis is on the application of various agile practices and the examination of their relationships. We created the list of 34 practices by combining earlier research [11], [22], and practitioner literature [12]. We paid special attention to the Scrum and XP methodologies. DevOps received further attention, and as a result, some DevOps techniques were added to the list. These practices were divided into three categories: organizational practices, engineering practices, and team tools. It is important to note that, while focusing on scaled agile methods, these practices only represent team level practices, as specified by the classification in [35]. As a result, there are no practices at the scaled level. The respondents were asked to rate how well their team used each of the 34 agile practices. The options

on the 3-point Likert scale were (i) used, (ii) used to some extent, (iii) not used, and (iv) a not known was offered. Table 1 displays the findings from the application of agile practices restricted only to replies where one of the Scaled Agile Methods was chosen as the primary employed method (n = 26). Only values associated with the options "used" and "used to some extent" are counted in the table. The practices are listed in descending order, which is determined by adding the frequencies of "used" and "used to some extent." The last column displays the sample size's (n = 26) percentage distribution of the total number of used practices (used + used to some extent). The findings reveal a high prevalence of adoption of organizational practices such as the use of a product backlog, short iterations, and a dedicated product owner by all teams employing scaled agile methods. 96% of teams employed a Scrum/Kanban board and daily meetings. Indicative of a promising trend is the widespread adoption of engineering best practices, including continuous integration (88%), collective ownership (88%), refactoring (81%), and coding standards (81%). On the other hand, a low usage of agile measures and management tools like team velocity, planning poker, burndown chart, and the definition of "Done" is seen, which represents a less unfavorable trend. There is a very low utilization of testing-related practices, particularly TDD, BDD, business-oriented automated tests, and test-last (i.e., classical) unit testing.

TABLE 1. PRACTICES EMPLOYED BY RESPONDENTS WHO CHOSE A SCALED AGILE METHOD (N=26)

Agile Practice	**Used**	**Used to a Some Extent**	**Total**	
Dedicated Product Owner	23	3	26	100%
Short iterations	18	8	26	100%
Product backlog	24	2	26	100%
Daily meeting/Stand-up	15	10	25	96%
Scrum/Kanban board	20	5	25	96%
40-hour week I Sustainable pace	10	14	24	92%
Iteration review/demo	16	8	24	92%
Iteration backlog	19	5	24	92%
Continuous integration	16	7	23	88%
Iteration planning	18	5	23	88%
Collective ownership	15	7	22	85%
Open office	19	3	22	85%
Scrum Master	16	6	22	85%
Release planning	15	7	22	85%
Refactoring	8	13	21	81%
Coding standards	13	8	21	81%
Iteration retrospective	16	5	21	81%
Cross-functional team	9	12	21	81%
Definition of "Done"	11	9	20	77%

Continuous delivery	8	11	19	73%
Simple design	5	14	19	73%
Team velocity	4	14	18	69%
Small releases	10	7	17	65%
Planning Poker I Team-based estimation	7	8	15	58%
Customer tests	2	11	13	50%
On-Site customer	5	8	13	50%
Burndown chart	6	6	12	46%
Business oriented automated tests	2	9	11	42%
Test-last unit testing	3	8	11	42%
Continuous deployment	4	7	11	42%
Metaphor	3	5	8	31%
Pair programming	2	5	7	27%
Test-driven development (TDD)	2	4	6	23%
Behavior-driven development (BDD)	1	1	2	8%

V. CONCLUSION

This paper analyzes a segment of a survey done among agile practitioners in Saudi Arabia that focused on the adoption and usage of scaled agile methods. The findings of the survey reveal a desire for the implementation of scaled agile methods in Saudi Arabia. Given that software development methodologies are rarely applied in a "by book" manner, a segment of the survey looked at the degree of Scaled Agile Methods customization. This leads to the following conclusion: Scaled Agile methods appear to be adapted to meet business requirements. This procedure verifies the hypothesis that agile methodologies and frameworks are merely tools for kicking off the agile transformation. Lack of suitable practices and precise instructions, particularly with regard to the software engineering methods incorporated into Scaled Agile Methods, may be the root of the requirement for customizing. The study also discusses how scaled Agile methods are seen as contributing to project success. In total, 77% of the respondents thought that scaled agile methods were rather or very beneficial. According to the survey, organizational practices are primarily used. Therefore, product backlog, short iterations, and dedicated product owner practices are used by all teams employing scaled agile methods.

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