Examining the Usage of Scaled Agile Methods in the Czech Republic

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Abstract

For the purpose of gathering data about the current usage of agile software development methods in the Czech Republic, a survey among the Czech agile practitioners was conducted. The research was based on a quantitative survey based on convenience sampling and evaluated by means of descriptive statistics. The paper describes a specific part of the survey, which focuses on the Scaled Agile Methods adoption and way of usage. The sub-sample of 26 answers was analysed to gain initial insights into the patterns of adoption of these methods in the Czech Republic. The results indicate that the usage of Scaled Agile Methods is not insignificant and generally in line with global results. The paper also outlines to what extent Scaled Agile Methods are tailored to company needs and how their benefits to project success are perceived by practitioners.

Keywords: agile methods, scaled agile methods, practices, survey.

1. Introduction

To succeed in today's environment, enterprises must be able to rapidly change the way of creating and delivering value to their customers. Software systems play a key role in this ability. Methods for their development must enable collaboration, innovation, and speed. The traditional waterfall methods have not adapted to the new challenge and agile methods have emerged. While agile methods were originally designed for use in small, single team projects [7], their benefits have made them attractive also for larger projects and in larger companies [14]. This fact has resulted in a birth of Scaled Agile Methods that are nowadays broadly adopted [12], [15].

In contrast to its broad application, data on the use of agile software development methods (ASDMs) and specifically Scaled Agile Methods worldwide are only very limited. As of the Czech Republic, there are little data on the up-to-date state of the ASDM adoption, and no data on the adoption of Scaled Agile Methods. To close that gap, we decided to design and conduct a survey among the Czech agile practitioners (ASDS-CZ survey). While the survey was focused on the ASDM adoption in the Czech Republic, in this paper we focus specifically on the Scaled Agile Methods adoption in detail due to a scope limitation. Thus, we analyse only the data related to these methods.

The rest of the paper is organized as follows. Following the Introduction, Section 2 describes Scaled Agile Methods and the state of their adoption worldwide. Next, Section 3 describes our research approach. Section 4 then presents and discusses the survey results. Finally, concluding remarks and research limitations are given.

2. Scaled Agile Methods

In 2021, we celebrate the 20th anniversary of the Agile Manifesto publication [4]. Even after two decades of their existence, ASDMs's popularity continue to grow. The benefits they bring to software development make them attractive also for larger projects and larger companies [14], despite their intriguing implementation within larger projects [17]. Compared to small projects, the larger ones are characterized by the need for an additional coordination element, which might make agile method implementation more sophisticated [6], [17]. What is more, large-scale agile involves additional concerns due to handling an inter-team coordination and interfacing with other organizational units, such as human resources, marketing and sales, and product management [34]. In addition, going large scale may cause end users and other key stakeholders to become distant from the development teams [14]. To treat these issues, a number of Scaled Agile Methods and frameworks have been developed. These include the Discipline Agile Delivery (DAD), Large-scale Scrum (LeSS), Scaled Agile Framework (SAFe), Enterprise Scrum, Scrum@Scale, Nexus, and Spotify. Scaled Agile Methods are nowadays both heavily used in practice [12], [15] and researched [2], [19, 20].

Total of seven Scaled Agile frameworks were selected for our research, so that we describe them in the following sections. The procedure of their selection is outlined in 3.1. These frameworks are categorized, based on the Horlach's et al. [19] categorization, as the Enterprise-focused approaches (Disciplined Agile Delivery, Scaled Agile Framework) and Inter-Team focused frameworks (Scrum of Scrums, Enterprise Scrum, Large-scale Scrum, Nexus, Spotify Model).

2.1. Scrum of Scrums

Scrum of Scrums is the oldest scaled agile method firstly introduced in 2001 by Jeff Sutherland [32]. It is applicable to large groups of people that are divided into Agile teams of 5-10 people. Each sub-team holds its Daily Scrum, where one member is designated as an "ambassador" to participate in the daily meeting with the ambassadors from other teams. In sum, such a set-up is called as the "Scrum of Scrums"[1]. At the Scrum of Scrums meeting, the ambassadors report the completions, next steps and impediments, on behalf of the teams they represent. They also strive to reach an agreement regarding formalization of technical interfaces, negotiate responsibility boundaries, etc.

2.2. Enterprise Scrum

Enterprise Scrum was developed by Mike Beedle and firstly presented in 2003. Since then, it has been tested in practice and evolved. According to the last Enterprise Scrum Definition 4.0 [5], Enterprise Scrum is defined as "a generic, customer-centric, iterative-incremental, all-at-once, scalable, results-oriented, subsumption-based management framework that seeks to quickly deliver the most business value and balanced benefits to all people involved, through autonomous, self-DMOS teams. Self-DMOS means self-directed, self-managed, self-organizing and self-selected".

2.3. Disciplined Agile Delivery

The Disciplined Agile Delivery (DAD) framework is a hybrid of existing methods such as Scrum, Kanban, Agile Modelling, SAFe, Extreme Programming, Agile Data, Unified Process and many others. DAD provides the flexibility to use various approaches and plugs the gaps not addressed by mainstream agile methods [3]. The main characteristics of this framework are that it: is a people first, learning oriented hybrid agile/lean approach; has a risk value delivery lifecycle; is goal-driven; is enterprise aware; is tactically scalable at the team level; and strategically scalable across all of the enterprise [26].

2.4. Scaled Agile Framework

The Scaled Agile Framework (SAFe) is a freely accessible knowledge base of proven, integrated patterns for enterprise-scale Lean-Agile development [28]. The SAFe was

created by Dean Leffingwell in 2012 and since then it has continually evolved to a current 5.0 version. The SAFe website [29] provides a guidance for scaling agile development across the Portfolio, Value Stream, Program, and Team levels that are part of the Big Picture, i.e. a visual overview of the Framework. The Framework is scalable and modular, allowing each organization to adapt it to its own business model. The Framework has four core values that help to make the SAFe effective: Alignment, Built-in Quality, Transparency, and Program Execution. The SAFe's practices are grounded on nine fundamental principles that have evolved from the agile principles and methods, Lean product development, systems thinking, and observation of successful enterprises. The heart of the SAFe is the Program level, which revolves around an organization called the Agile Release Train (ART). Each ART aligns teams to a common mission and vision via a single program backlog and produces valuable and evaluable system-level solutions every two weeks. The Agile teams in an ART have the following choice of methods: Scrum, Kanban, and XP. They also use built-in quality practices. Each SAFe portfolio has the value streams, people, and processes necessary to provide Lean-Agile funding and governance for the products, services, and solutions required to fulfil its business strategy [28].

2.5. Large-scale Scrum

The Large-scale Scrum (LeSS) framework was created by Bas Vodde and Craig Larman in 2013 based on their experiences working with large-scale product development. As both authors state in [25], scaling Scrum starts with understanding and being able to adopt standard one-team Scrum. Large-scale Scrum requires examining the purpose of single-team Scrum elements and figuring out how to reach the same purpose while staying within the constraints of the standard Scrum rules. LeSS provides two different large-scale Scrum frameworks [33], i.e. the basic LeSS applicable up to eight teams (of eight people each) and the LeSS Huge that introduces additional scaling elements for development up to hundreds of developers.

2.6. Nexus

The Nexus framework was developed in 2015 by Ken Schwaber and Scrum.org. The framework aims at multiple Scrum Teams (approximately three to nine) working together on a single Product Backlog to create an Integrated Increment [30]. Compared to the general Scrum framework, Nexus introduced a new role, namely the *Nexus Integration Team*, which thereafter consists of Nexus Integration Team members, a Scrum Master and a Product Owner. Altogether they ensure that Nexus is applied with the Scrum approach in mind. The events within the Nexus framework are almost the same as within the Scrum approach. A Nexus Sprint Backlog is added as a new artefact which helps the scrum teams with transparency. Each team has also its own backlog.

2.7. Spotify Model

Spotify is a relatively young company, established in 2008 in Stockholm, Sweden. Spotify has grown very fast – over 3 years – from 30 to 250 people. To be able to handle this growth, they developed a scaling model – with *Squads, Tribes, Chapters*, and *Guilds*. This model, which was titled as the Spotify Model, may be used by other companies. A Squad is the smallest working unit in Spotify, similar to the Scrum team, and is designed to feel like a mini-startup [21]. A Squad is a small cross-functional self-organizing team, with usually less than 8 people sitting together and having end-to-end responsibility to the projects they are building. Each Squad has its own long-term mission and autonomy. This means that each Squad decides what to build, how to build that and how to work together. Squads which are working in related areas are grouped in Tribes. Each Tribe has a Tribe Lead who is responsible for providing the best possible habitat for the Squads within that Tribe. A Chapter is a new type of organizational structure that groups people by their competencies, e.g. their skills, experience and knowledge. Each Chapter meets regularly to discuss their area of expertise and their specific challenges. A Guild is a more organic and wide-reaching "community of interest", i.e. a group of people that want to share knowledge, tools, code, and practices. Chapters are always local to a Tribe, while

a Guild usually cuts across the whole organization [21].

2.8.   State of Scaled Agile Method Adoption

In the world of business practice, the "State of Agile" survey with a global reach has been conducted by VersionOne (later CollabNet VersionOne) annually since 2006. Since 2013 this well-known practitioner survey has also added a part focused on Scaled Agile Methods. The recent (14th) edition [13] was carried out between August and December 2019. Agile software development methods (ASDMs) adoption has been also of interest to many scientists [11], [14], [22], [24].

The motivation for our research is as follows. In contrast to a broad coverage of data on the ASDMs usage worldwide, the data about their usage in the Czech Republic are quite rare [8, 9], [36] and do not include Scaled Agile Methods.

3. Research Method

In this section, the construction and execution of the ASDS-CZ survey are described. We focus specifically on the Scaled Agile Methods adoption in the Czech Republic, thus researching the part of the overall survey related to the usage of Scaled Agile Methods. In Section 3.1, a corresponding part of the survey design is described. Then, in Section 3.2, the method of data collection is discussed.

3.1.   Survey Design

The main goal of the ASDS-CZ survey was to evaluate how the agile approaches to software delivery are used in the Czech Republic. This goal was decomposed into several objectives and related research questions. Due to the focus and scope of this paper, we concentrate only on a set of research questions related to Scaled Agile Methods. We aim to uncover:

RQ1: What is the level of the Scaled Agile Method adoption in the Czech Republic?
RQ2: To what extent are Scaled Agile Methods tailored to company needs?
RQ3: How are the benefits of using Scaled Agile Methods perceived?
RQ4: Which agile practices are used together with Scaled Agile Methods?

The survey instrument contained 18 questions divided into three logical parts:
* General demographic characteristics of respondents and primary ASDM used by the team.
* Used agile practices.
* Concluding demographics questions.

The survey was available in the Czech language. However, the titles of agile practices were supplemented with English equivalents, as many Czech practitioners commonly use the original English terms instead of their formal Czech titles.

To specify a primary ASDM that the team uses, a list of ASDMs derived from the State of Agile survey [12] was offered to the respondents. Considering the increasing usage of the hybrid waterfall agile approaches [23], the Waterfall/Scrum method as a label for this combination was added. Offered ASDMs included: Crystal Family; DAD (Disciplined Agile Delivery); DSDM; Enterprise Scrum; Extreme Programming (XP); Kanban; Lean; LeSS (Large Scale Scrum); Nexus; SAFe (Scaled Agile Framework); Scrum; Scrum of Scrums; Scrumban (Scrum + Kanban); ScrumXP (Scrum + XP); Spotify Model; Waterfall/Scrum; Company Methodology; Other. Respondents were able to select just one of these methods, i.e. the reference method on which the practices used by the team were dominantly based on.

3.2.   Data Collection

The questionnaire was implemented using the *LimeSurvey* tool and was made available online. We used a convenience sampling strategy [18], in which social platforms played a key role. We shared the link to the survey in 17 professional and alumni LinkedIn and

Facebook groups containing ca. 20,000 members (who were mostly Czechs or Slovaks) in total. This was followed by sharing the link with our industry contacts (ca. 50), either via LinkedIn messaging or by email. Then, an advertising campaign was conducted through the LinkedIn network in which 1401 users were addressed. In total, we gained 324 responses. Of them, 101 were not completed, 32 deleted by the participants, and 191 completed and valid. From the set of 191 completed responses, 22 responses were subsequently removed by us during the analysis, as the respondents indicated they had not been working with any agile team in the time of data collection. Thus, 169 relevant responses were further analyzed by applying the basic methods of descriptive statistics.

4. Results Analysis and Discussion

This section firstly provides respondent demographics and background. Then, it presents the survey results on the usage of Scaled Agile Methods among Czech companies, including a detailed analysis of their application, tailoring and benefits.

4.1. Respondent Demographics

As to the industry sector, most of the respondents were from the domain of Information Technology/Software Development (40%) and Finance (10%). Other domains were less frequent (from 4 % to 7% each). Then we analysed the respondents' job position and years of experience. Most respondents acted as the members of the development team (43%), other quite balanced groups were represented by the Product Owners (15%) and Agile coach/Scrum Masters (17%). We found out that the managerial IT roles, Product Owners and Scrum Masters had longer experience with agile methods (mostly more than 3 years) than the members of development teams (mostly less than 3 years). Independently of job position, the experience with agile methods was equally divided to the groups of 1 to 2 years (26%), 3 to 4 years (30%) and more than 5 years (27%) of experience with ASDMs.

4.2. Usage of Scaled Agile Methods

Figure 1 shows the usage of all the methods examined in the survey. For the purpose of making the graph more illuminating, some methods were aggregated. Hence, the group titled Scaled Agile contains the methods as follow: DAD (Disciplined Agile Delivery); Enterprise Scrum; LeSS (Large Scale Scrum); Nexus; SAFe (Scaled Agile Framework); Scrum of Scrums; Spotify Model. Then Lean and DSDM with zero usage and XP with 1% usage were aggregated together with the Other group into a group named Other. Looking at Figure 1, it is apparent that the most widely used agile method is Scrum, reported by 44% respondents. Scrum altogether with its agile extensions (i.e. Scrum/XP hybrid and Scrumban) counts for a majority of 63%. In total, Scaled Agile Methods are reported to be used by 15% of the respondents.
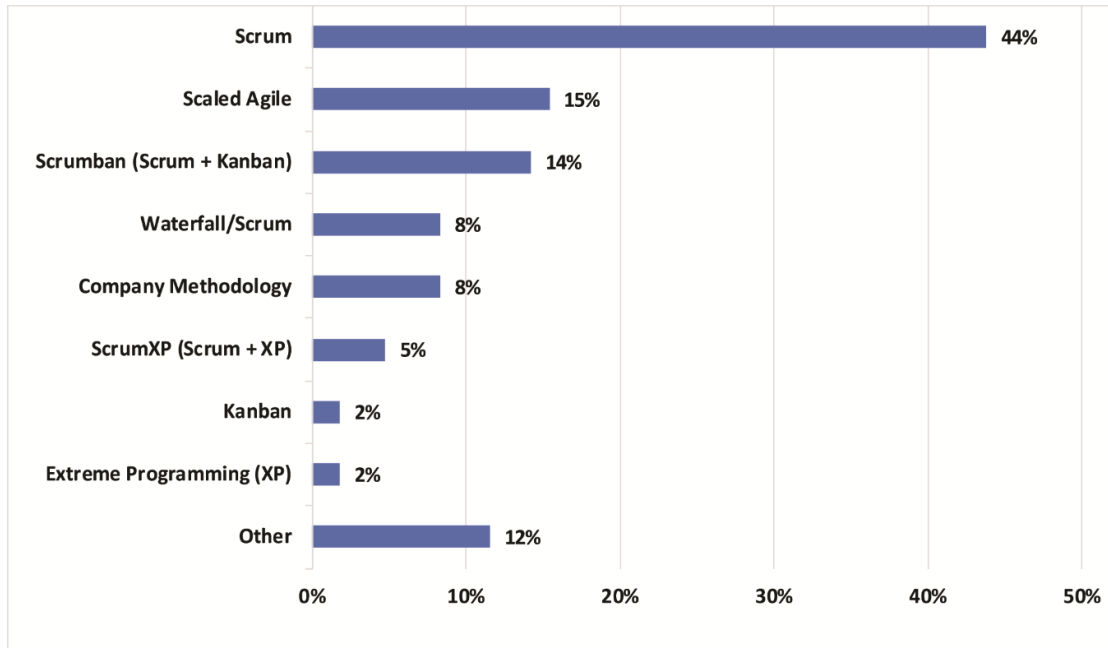
Fig. 1. Agile methods usage

Looking specifically on Scaled Agile Methods, the proportion of their usage is shown in Figure 2. The most used method is the SAFe (42%) followed by Less and Scrum of Scrums with the same share (15%). Quite a significant share occupies the Spotify Model and Enterprise Scrum (both 12%). The leading position of the SAFe is in line with the results of the CollabNet VersionOne survey [12]. However, our results demonstrate even a higher percentage of the SAFe usage (42% compared to 30% worldwide). Similar higher usage is valid for the Spotify Model (12% compared to 5% worldwide) and Enterprise Scrum (12% compared to 3% worldwide).
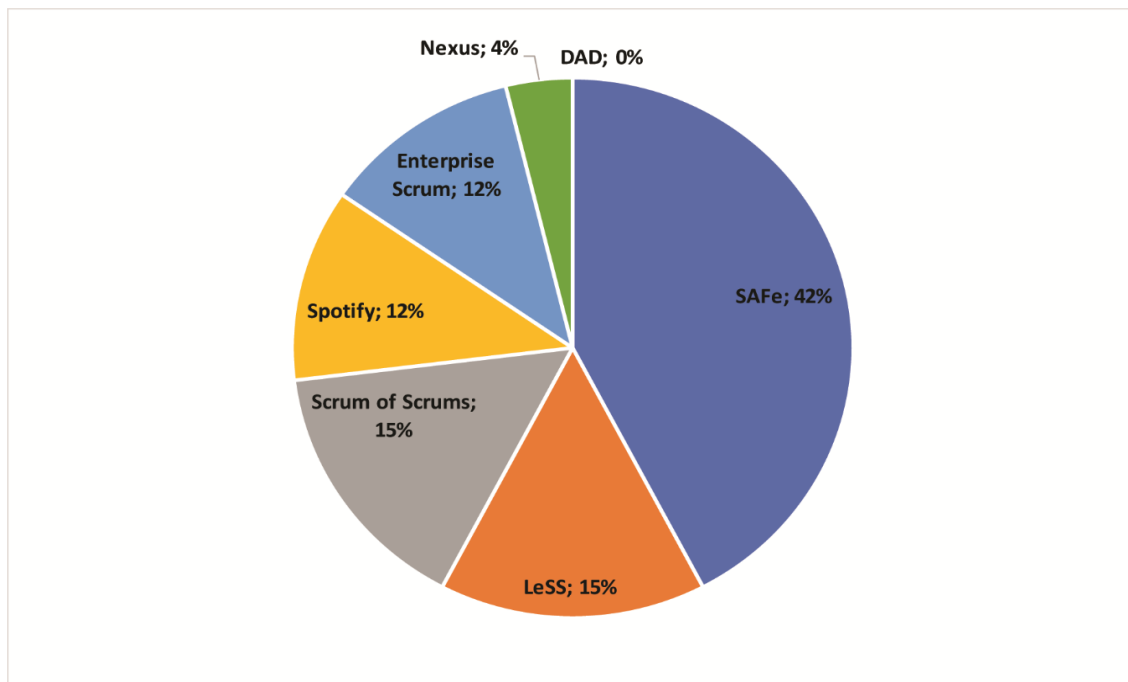

Fig. 2. Proportion of Scaled Agile Methods usage (n=26)

ASDMs usage in companies of various sizes is showed in Figure 3. The leading position of Scrum hybrids continues to be apparent across all company size segments. Scaled Agile Methods are, not surprisingly, implemented especially in larger companies. To a lesser extent, they are used also in small and medium-sized companies.
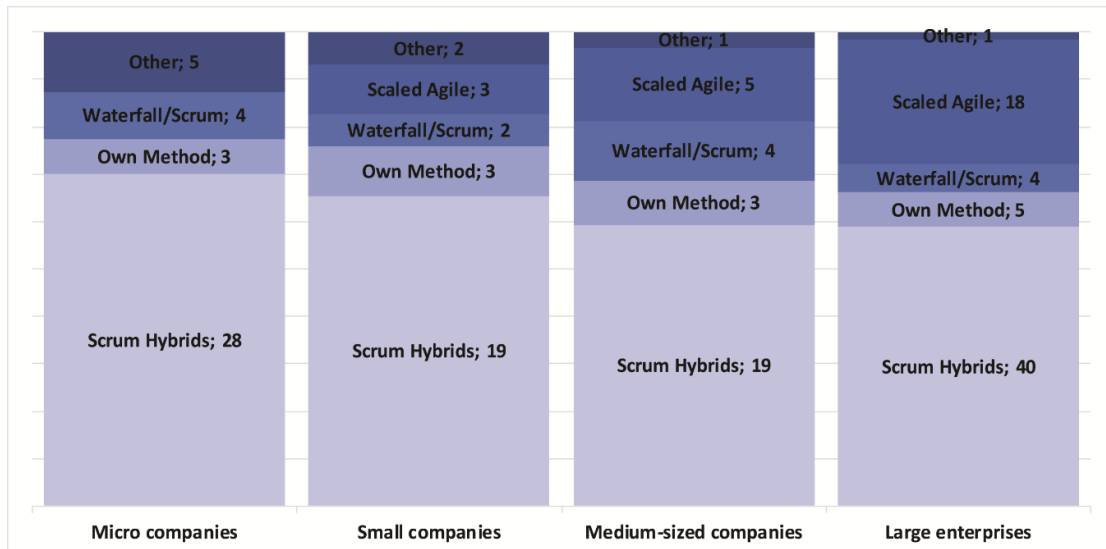
Fig. 3. Agile methods usage per company size (Micro companies – less than 10 employees; Small companies – 10 to 49 employees; Medium-sized companies – 50 to 249 employees; Large enterprises – 250 or more employees)

4.3. Scaled Agile Methods Tailoring

Software development methods are rarely implemented in a "by book" manner [16]. By contrast, individual software practices are selected, adapted, and combined, resulting in *method tailoring*. We wanted to examine to what extent Scaled Agile Methods were tailored to company needs (RQ2). To answer the research question, we restricted the sample only to the responses where only one of the Scaled Agile Methods was selected as the primary used method (n=26). Figure 4 depicts the responses for individual Scaled Agile Methods and in the last row for Scaled Agile Methods in total.
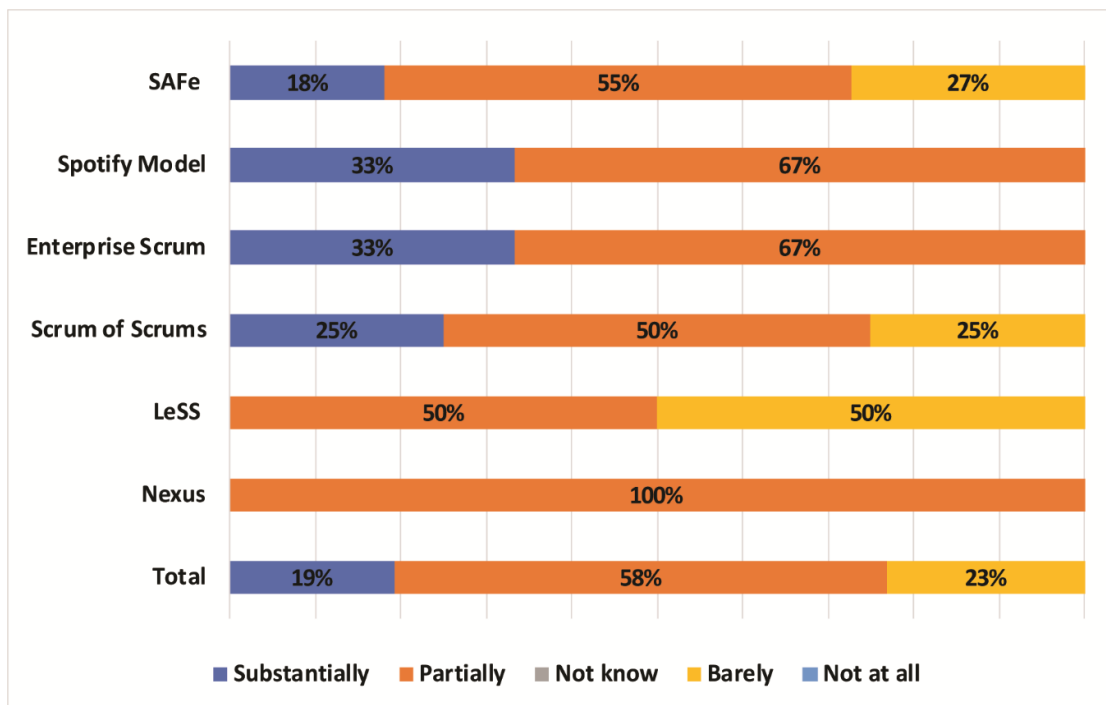

Fig. 4. To what extent was the by book Scaled Agile Method tailored to company needs. The 5-point Likert scale was offered to the respondents with the values: (i) substantially tailored; (ii) partially tailored; (iii) do not know; (iv) barely tailored; (v) not at all tailored.

In total, Scaled Agile Methods were tailored to company needs mostly partially (58%) or substantially (19%). The barely tailored option selected 23% of the respondents. Also, individual Scaled Agile Methods were tailored to company needs mostly partially or substantially. The not at all option was not selected by any respondent. These results confirm the original ideas standing behind the agile approaches; that is, agile methods and frameworks are only a tool for starting the agile transformation. In fact, the core of agile thinking is the idea that the process needs to be adapted to individual company needs [10]. Further, such pro-tailoring results indicate the fact that existing Scaled Agile Methods (and of course all agile methods) do not encompass all needed practices. This is especially true with Scrum or Kanban, as these are the methods focused predominantly on project management, and thus not encompassing the needed software engineering practices. This is similarly valid for Scaled Agile Methods, as these are based mostly on Scrum. These possible causes shall be further explored. We plan to do so in a subsequent qualitative research.

4.4.   Perceived Benefits

In this section, the analysis answering the research question RQ3 is carried out. Again, the sample was restricted only to those responses claiming the use of Scaled Agile Methods (n=26). The respondents were asked to estimate the level of benefits that brings the method to their team in relation to project success. Project success was defined in terms of the Standish Group criteria [31]: software project delivered on time, on budget and with a satisfactory result. Figure 5 shows the results for individual Scaled Agile methods. The last row provides aggregated proportions.
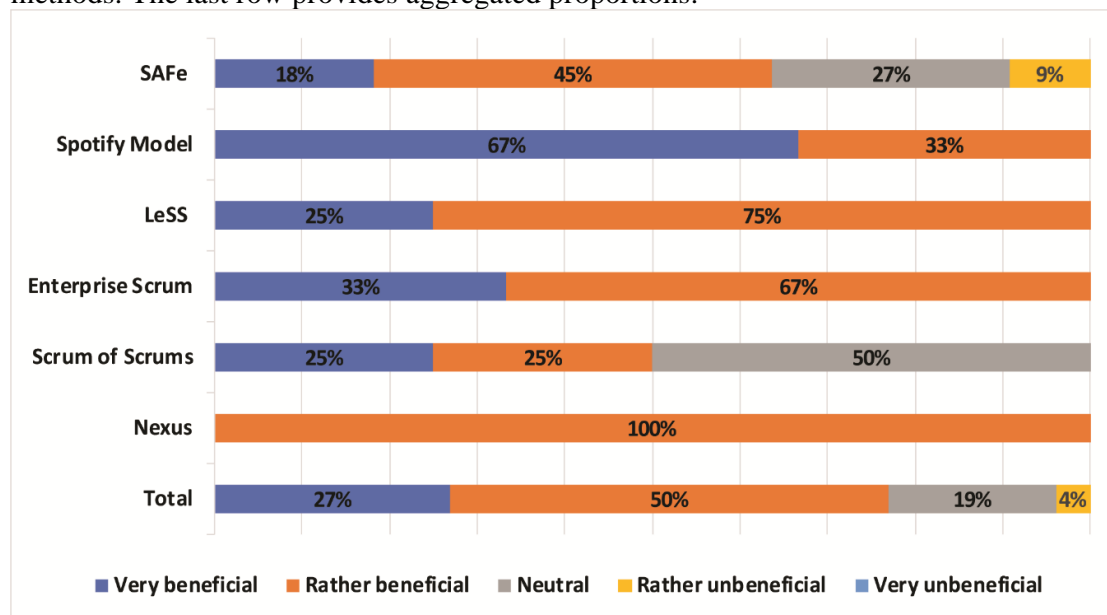

Fig. 5. Perceived benefits of individual Scaled Agile Methods to project success. The 5-point Likert scale with the values (i) very beneficial; (ii) rather beneficial; (iii) neutral; (iv) rather unbeneficial; (v) very unbeneficial also contained the possibility "do not know" (not shown).

In total, Scaled Agile Methods were ranked by 50% of the respondents as rather beneficial and by one third as very beneficial. These results indicate the need for using Scaled Agile Methods as an enabler in digital transformation efforts among the Czech practitioners. None of the Scaled Agile Methods were ranked as very unbeneficial, only in one case, the SAFe was perceived as rather unbeneficial. The data show a high satisfaction and perceived benefits mainly in the case of the Spotify Model. Thus, we plan to further examine these results in a subsequent qualitative research as well.

4.5.   Agile Practices Usage

An important part of the ASDS-CZ survey was focused on the usage of various agile

practices and the analysis of the relationships among them. We prepared the list of 34 practices, derived by synthesising previous research [11], [22] and practitioner literature [12]. We put particular attention on the practices introduced by Scrum and XP. We paid some extra attention to DevOps, so that we added certain DevOps practices to the list. We categorized these practices into 3 groups: Organizational practices, Engineering practices and Team tools. Focusing specifically on Scaled Agile Methods, it must be stated, that these practices represent just the team level practices according to categorization defined in [35]. That means, there are no practices for the scaled level.

The respondents were asked to evaluate the usage of each of 34 agile practices within their team. The 3-point Likert scale with the values: (i) used; (ii) used to a certain extent; (iii) not used; and (iv) a not know was offered. Table 1 shows the results of the usage of agile practices restricted only to the responses where one of the Scaled Agile Methods was selected as the primary used method (n=26). In the table, only values related to the possibilities "used" and "used to a certain extent" are counted. The practices are presented in descending order, which is based on the sum of "used" and used to a certain extent" frequencies. Last column shows the percentage share of the sum of the used practices (used + used to a certain extent) among the sample size (n=26).

The results demonstrate that the Organizational practices are mostly used. All teams utilizing Scaled Agile Methods used Product backlog, Short iterations and Dedicated product owner. 96% of teams used Daily meetings and Scrum/Kanban board. Representing a positive trend, a high usage of engineering practices, especially Continuous integration (88%), Collective ownership (88%), Refactoring (81%) and Coding standards (81%) is apparent. On the other hand, representing a less unfavourable trend, a low usage of agile measures and estimation and management tools like Team velocity, Planning poker, Burndown chart and Definition of "Done" is apparent. As somewhat alarming, one can notice a very low usage of testing-related practices, especially TDD, BDD, Business oriented automated tests, and test-last (i.e. classical) unit testing.

Table 1. Practices used by respondents who selected one of Scaled Agile Methods (n=26)

Agile Practice	Used	Used to a Certain Extent	Total	
Dedicated Product Owner	24	2	26	100%
Short iterations	19	7	26	100%
Product backlog	25	1	26	100%
Daily meeting/Stand-up	16	9	25	96%
Scrum/Kanban board	21	4	25	96%
40-hour week / Sustainable pace	11	13	24	92%
Iteration review/demo	17	7	24	92%
Iteration backlog	20	4	24	92%
Continuous integration	17	6	23	88%
Iteration planning	19	4	23	88%
Collective ownership	16	6	22	85%
Open office	20	2	22	85%
Scrum Master	17	5	22	85%
Release planning	16	6	22	85%
Refactoring	9	12	21	81%
Coding standards	14	7	21	81%
Iteration retrospective	17	4	21	81%
Cross-functional team	10	11	21	81%
Definition of "Done"	12	8	20	77%
Continuous delivery	9	10	19	73%

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

5. Conclusion

This paper analyses a part of the survey conducted among the Czech agile practitioners that focused on the Scaled Agile Methods adoption and way of usage. The results of the survey indicate interest in Scaled Agile Methods usage in the Czech Republic. As software development methods are rarely implemented in a "by book" manner, certain part of the survey examined the level of Scaled Agile Methods tailoring. A conclusion can be proposed as follows. Scaled Agile Methods seem to be tailored in line with company needs. This process confirms the original ideas that agile methods and frameworks are only a tool for starting the agile transformation. The need for tailoring can be caused by the lack of appropriate practices and clear guidance, especially with regards to software engineering practices embedded in Scaled Agile Methods.

The paper also presents perceived contribution of Scaled Agile Methods to project success. Scaled Agile Methods were in total evaluated by 77% of the respondents as rather or very beneficial. The survey demonstrates that the Organizational practices are mostly used. All teams utilizing Scaled Agile Methods then do use Product backlog, Short iterations, and Dedicated product owner practices.

This paper suffers from several limitations. First, in our survey we employed convenience sampling. While this approach is common in the domain of ASDM surveys [22], [27], the sample size is the main limiting factor also in our case [18]. Connected with this, we made use of social networks for the purpose of survey distribution. This certainly introduced a form of bias, limiting the possibility of participation to the users of that media. Second, the analysis presented here is based on the sub-sample of 26 respondents using Scaled Agile Methods. Clearly, this is a significant limitation. On the other hand, one might want to take into consideration that using Scaled Agile Methods is not yet a mainstream approach – only a fraction of companies does so, as our results demonstrate. In that sense, providing indicative results on the level of adoption is desirable, and paves the way towards future studies with larger sample sizes and more insightful findings.

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