

Scaling Agile Software Development to Large and Globally Distributed Large-scale Organizations

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ABSTRACT

There has been a tremendous increase in the rate of agile method adoption across large and globally distributed large organizations. Despite of several challenges, organizations have shown profound interest due to the potential benefits of agile at small scale. Several scaling frameworks and scaling practices have been proposed by the consultants and practitioners to support globally distributed large scale agile transformations. The present research has 3 dimensions: (i) scaling practices (ii) scaling frameworks (iii) enterprise agile. Various research methods have been adopted in the study to address the these dimensions. This would help agile practitioners and consultants to reflect on the scaling approaches and help them during the agile transformation process across large and globally distributed large organizations.

KEYWORDS

Large scale, distributed large scale, scaling frameworks, enterprise agile.

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1 INTRODUCTION

Agile development methods were originally designed for small and co-located teams [4]. Today, agile methods are popular in large scale and complex software projects involving multiple teams spread across different geographic locations [30]. This has led to transformation of single-site agile teams to multi-site large scale distributed agile software development. Potential benefits of agile methods at small scale [16] have triggered organizations adopt agile methods in large scale and also in global endeavours. Several agile scaling frameworks such as Scaled Agile Framework (SAFe) [24], Large Scale Scrum (LeSS) [23], Disciplined Agile Delivery (DAD) [3] have

been proposed by consultants and practitioners to support large and distributed large organizations to scale agile.

Large scale agile has been a burning research topic among the agile practitioners and researchers [7, 11]. Workshops on large scale agile organized in XP 2013, XP 2014 and XP 2017 international conferences have highlighted the need for more research into scaling agile and agile scaling frameworks [9, 10, 25].

Different definitions of the term “large” in “large-scale” have been reported in the literature. Large is characterized with respect to number of teams, team-size, complexity, lines of code, time duration and cost of the project [7]. Based on various such definitions, Torgeir Dingsoyr, in the taxonomy of large referred large as “2 or more teams” [8]. Based on the previous findings on large, in this present research, large is defined with respect to size of the software organization and number of teams. When the organization has distributed teams across different geographical locations, it is defined as distributed large scale. “Scaling” is defined as scaling agile to “more number of teams” and “scaling to other organizational units or non development units” such as marketing, finance and HR.

2 BACKGROUND

Many different secondary studies have been conducted in large-scale addressing topics such as: organizational, managerial and cultural aspects in large and distributed large projects (28 studies) [32], challenges and success factors during large scale agile transformations (52 studies) [7], inter-coordination roles in large projects (42 studies) [15], role of architects in scaling frameworks [36], scalability and adopt-ability (51 studies) [21] and quality requirements in large scale (60 studies) [2]. Only one comparative review on scaling frameworks is reported in the literature [1]. The systematic literature review conducted on large scale agile transformations, has reported, only 6 case studies in large scale agile and rest 46 studies were experience reports. This further motivates need for more in depth primary studies in large scale agile [7].

3 PROBLEM STATEMENT

The research problem can be categorized into three main domains: (a) *Scaling Practices* (b) *Agile Scaling Frameworks* (c) *Enterprise Agile*. Many large and globally distributed large organizations adopting the scaling frameworks have published their experience reports via home pages of the frameworks such as SAFe and LeSS. There is need to consider this grey literature as number of peer reviewed studies is limited. Analyzing the grey literature would “close the gap between the academic literature and practitioners” [13] and aggregates the voice, opinions and experiences of industrial practitioners [26]. Elimination of this literature may lead to indefinite conclusions. Therefore, there is a need to conduct systematic literature reviews

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including these case studies from the official websites of the scaling frameworks [6, 12, 18]. Inclusion of this grey literature can be considered as a threat, as the information reported is based on the opinions and experiences rather than systematic data collection procedures and analysis [12]. However, the case studies published in the official website of Scaled Agile Framework, have a strict review and data collection procedures. Organizations initially answer a questionnaire and thereafter, scaled agile team reviews the answers and supplements provided by the organizations. The team contacts organizations for interviews with key members responsible during the SAFe implementation to gather the background information [17]. Drafts are written with the help of case study specialists. These are reviewed and approved by the organizations before publishing on the website [17]. It has also been stated that, they only publish reports of mature SAFe organizations (after 18-24 months of SAFe implementation). This review process ensures the credibility of the information collected from the case studies. Hence, these case studies should be included for the literature studies in the domain of scaling frameworks.

Systematic exploration of *scaling practices*, adopted by the organizations to support large scale agile transformation [7, 25] have not been reported in the existing literature. The contextual information about how these practices are applied and the respective benefits and challenges have also been not reported systematically [29].

There is a need for more in-depth investigation on how to implement the agile scaling frameworks [25, 34]. At the moment, SAFe has been most predominant framework adopted by large enterprises developing software (according to the Agile Version One Survey 28% organizations have adopted SAFe) [27]. Only few peer reviewed primary studies have been published [5, 22, 28, 31, 35], since its introduction in the year 2011. Scientific literature (peer reviewed) on SAFe framework did not focus on investigating reasons, usage, suitability, transformation steps, benefits and challenges of SAFe adoption. Most of the industrial case studies have mentioned about the benefits of adoption in comparison to the challenges. These industrial reports have given more insights on transformation steps, reasons compared to the peer reviewed literature. Hence there is need for conducting more in depth primary studies on SAFe framework to investigate the reasons, transformation process, benefits and challenges to establish scientific evidence [25].

Agile is adopted at various levels, enterprise agile integration has been a burning research topic. Integration of non-development functions into agile framework has been one of the challenge identified in the literature [7]. Thus, its interesting to explore, how organizations integrate non-development units such as HR, sales and marketing [7, 14].

Literature needs to full-fill these gaps to reduce the barriers for agile adoption across large and distributed large organizations.

4 RESEARCH QUESTIONS

The following research questions have been formulated to address the gaps and contribute to the literature in realm of agile in large and distributed large scale.

- RQ1. What are the different reasons, transformation steps, benefits and challenges reported in existing literature on

adoption of scaling frameworks across large and distributed large scale organizations ?

- RQ2. What are the different scaling practices reported in the existing literature to support scaling of agile development to large and distributed large scale organizations ?
- RQ3a. How do organizations implement scaling frameworks across large and distributed large scale organizations ?
- RQ3b. What are the challenges and benefits of adopting scaling frameworks across large and distributed large organizations ?
- RQ4. How do organizations integrate non development functions for achieving enterprise agile transformations ?

5 RESEARCH METHOD

Different research methods have been adopted to address the research questions formulated. For addressing RQ1 and RQ2, systematic literature reviews (SLR) were conducted [20]. For RQ1: a keyword search across four scientific databases: Scopus, IEEE Explorer, Web of Science and ACM and the grey literature published in the homepage of Scaled Agile Framework was also included along with the peer reviewed literature [18]. To investigate the scaling practices adopted to support the large scale transformations, key word search across the scientific databases similar to RQ1 (excluded grey literature here) was conducted.

RQ3 and RQ4, will require in-depth investigations to explore the contemporary phenomenon [33]. For RQ3a and R3b, multiple case studies on SAFe framework will be conducted (SAFe was chosen, as majority of the organizations have implemented, if time permits other frameworks might be considered as-well). Data is collected through semi-structural interviews from software organizations who have adopted SAFe. The interviewees include: professionals working with SAFe framework such as project managers, product owners, software developers, scrum masters, release train engineers, product owner, members from Lean and Agile Center of Excellence (LACE), agile coaches and scaled agile partners. These interviews will focus on the gaps that were found during the literature review on SAFe framework.

For RQ4, data will be collected from multiple cases, who have scaled agile to enterprise. The data collected from SAFe organizations on integration of other units to agile will be overlapped with other cases. Data is collected from key members involved during the transformation process and integration of non development units such as project managers, senior developers and members from others units such as marketing, finance and HR.

Analysis for RQ1, RQ2, RQ3 and RQ4 is done by open and axial coding of the qualitative data from the research papers and semi structural interviews from the respondents by a qualitative coding tool Nvivo 11 [19].

6 INITIAL RESULTS

The research process was started with review of on scaling frameworks and scaling practices. The following are the preliminary results obtained by the analysis.

(I) Scaled Agile Framework (SAFe): Systematic Literature Review

identified 46 organizations adopting SAFe from peer reviewed (scientific databases) and non peer reviewed literature (case studies from homepage of SAFe framework). Results:

- (i) Reasons for adoption: well proven structure, market demands, faster delivery, scale more people.
- (ii) Benefits of adoption: quality, transparency, collaboration, productivity and alignment.
- (iii) Challenges of adoption: change resistance, moving away from agile, controversies with framework, Program Increment challenges, Agile Release Train challenges, GSD challenges.
- (iv) Transformation steps: cultural shift, SAFe training's and workshops, transformation teams, value streams mapping, team formations, integration of waterfall and non development units to agile.

(II) Scaling Practices - Systematic Literature Review: keyword search across different databases has identified 1330 papers. The following major codes have been identified from the preliminary analysis:

- (i) Scaling practices for more teams: PI planning, agile release trains.
- (ii) Scaling engineering practices across the iterations: Synchronized sprints, biweekly meets, quarterly meets, hardening sprints.
- (iii) Scaling roles: Area Product Owners (APO's), Proxy Product Owners (PPO's).
- (iv) Scaling scrum artifacts: portfolio management, backlog management.
- (v) Scaling frameworks: SAFe, LeSS, DAD.
- (vi) Scaling architecture.

(III) Currently, author and the supervisor are collecting data from from multiple organizations, which have implemented SAFe in large and distributed large organizations.

7 FUTURE WORK

The present study investigates into implementation of Scaled Agile Framework (SAFe). It is interesting to consider other scaling frameworks such as LeSS and DAD. The results of different frameworks could be compared with each other as part of future research.

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